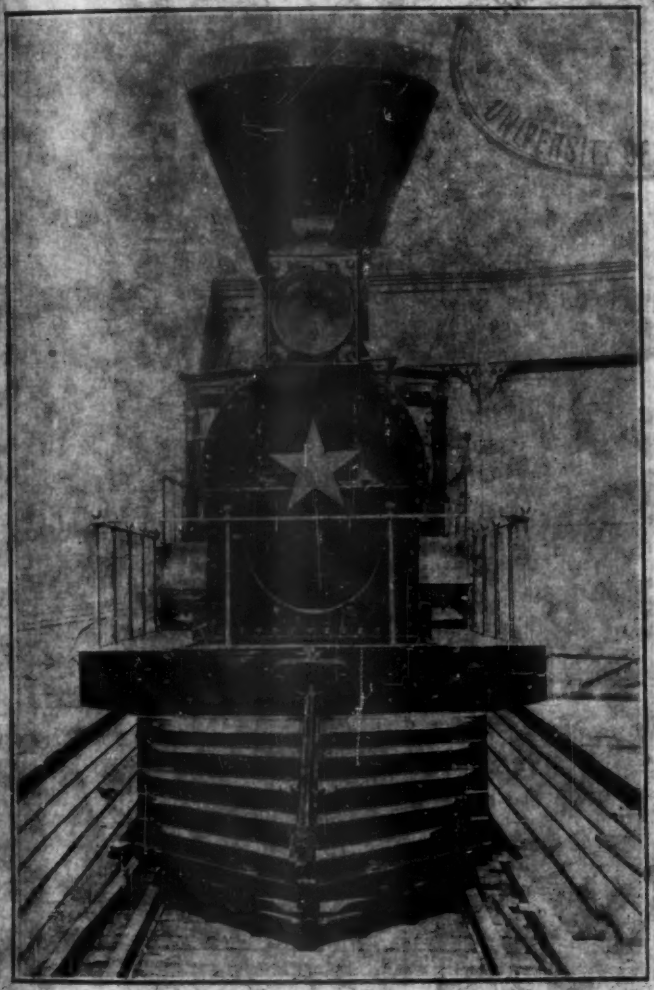
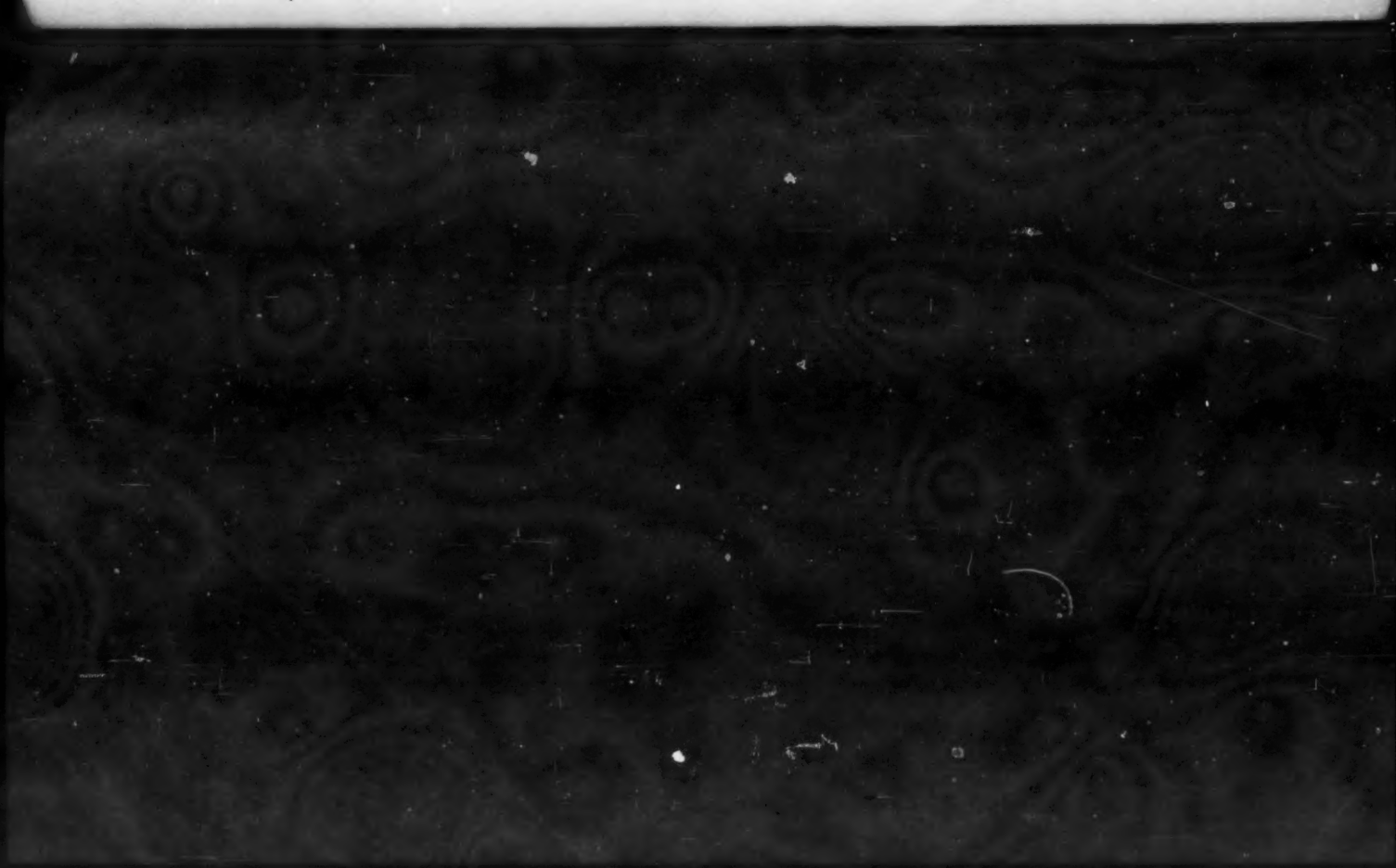
BULLETIN No. 7



THE RAILWAY AND LOCOMOTIVE
HISTORICAL SOCIETY



THE RAILWAY AND LOCOMOTIVE HISTORICAL SOCIETY

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Copies of this Bulletin can be procured from either Mr. Herbert Fisher or Mr. J. W. Merrill.

Again we present to our members and readers another bulletin and this, our Seventh. Of the many valuable contributions that have appeared in our bulletins there is none that has aroused the interest as the list of locomotives of 1838 that appeared in our last issue. This list furnishes a foundation of information in regards to the early locomotives of this country. Unfortunately more lists were never made but it is possible that additional ones might be constructed.

Not long ago a suggestion was made that this Society get together and write up the history of the various locomotive builders in this country. No small task—but many shoulders make the burden light. New England had her share of the locomotive industry at one time. There was much of it in New York, New Jersey, Pennsylvania and other states. Beginning with that list of builders as found in the list of 1838, let us add to it and, what is more, will our members give what information they can find, such lists as they can furnish with regards to builders in their immediate vicinity.

A start has already been made. In our Second Bulletin we touched on the Mason and Taunton Locomotive Works, in a subsequent bulletin appeared a list of the Amoskeag Co., and Mr. Clark has contributed an interesting article on the Locks & Canal Co. at Lowell, Mass. Who is going to write the next one? Let's hunt up the locomotive industry in our own immediate vicinity and put this information where all the members can read it!

A man who began his railroad career in 1856, on the old Louisville & Frankfort R. R. has given us the opportunity to read of some of his experiences and also to add to our fund of information of the early railroads in that state. It is with distinct pleasure that I recall the visit I paid Mr. Vaughn. I wish conditions were such that I could make them oftener because he is such an interesting story teller. I not only take pleasure in reproducing Mr. Vaughn's article, but in connection with it I have reproduced a few interesting locomotives that I saw still in service in Kentucky last summer. An old Taunton, built in 1871, an old Rogers built in the seventies and with the fluted sand dome and steam dome covers, these indeed are rarities and not to be passed lightly! Our eastern locomotives went all over the country! The more reason we should have to brush up our knowledge of these western and southern roads and become more intimate and acquainted with their early motive power.

Once again Mr. Joslyn has favored us with another interesting article, and this time he gives us a list of the first one hundred and sixty-three locomotives on the Central Pacific, adding some interesting comments thereto. What an interesting assortment of locomotive builders is present, and what an interesting history some of these locomotives had.

A new writer, Mr. C. Warren Anderson, has favored us with a contribution on the early engines of Nova Scotia. Mr. Winey has allowed us to reproduce a very valuable report of the engines of the South Carolina Railroad. The reproductions that accompany this article are copies made from the original drawings, and also furnished by Mr. Winey.

QUESTION BOX.

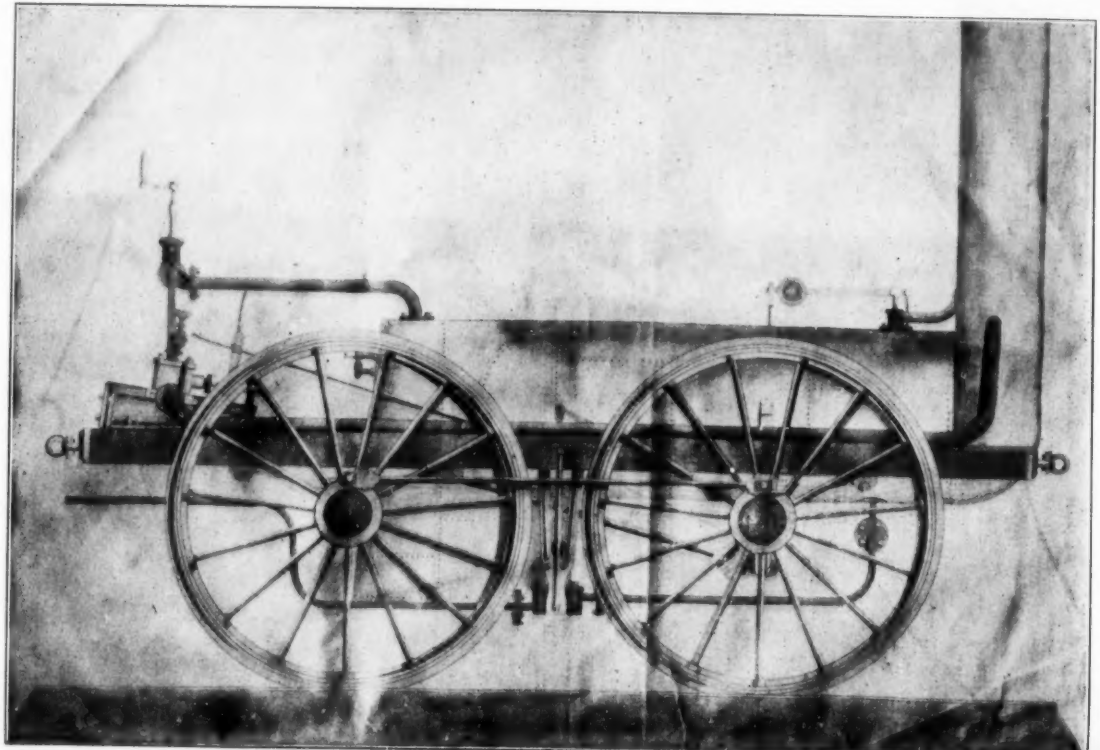
Mr. Clarence O. Becker, Fieldhead, Myddleton, Ilkley, England, has written as follows:

"Angus Sinclair in his book shows on page 111 a picture of

James' engine, 1832, with the link motion. I should like to know whether anything for certain is known about that engine, and if it had the link motion originally".

"There is another locomotive upon which more information would be of value, and that is the articulated locomotive designed by Horatio Allen for the South Carolina Railroad in 1831. The published drawings of this engine are very defective and leave much to be conjectured, for instance, how were the cylinders connected and where did the fireman stand, and where was the firedoor? The cylinders are shown fixed to the boiler on the drawing of this engine in Brown's book on the History of the first Locomotives in America, but I cannot understand how they drove the crank axle, seeing that the latter was allowed to swivel. If you will refer to the pictures of this engine you will see my point, and I think you will agree with me that as shown on the drawings it could never have worked. Another point is about the fuel, where was it carried? Could any of our members throw any daylight on this most interesting engine?"

I am sure Mr. Becker will appreciate any replies that our members can make relative to the above.



Copy of Original Drawing of the "DeWitt Clinton."

Through the kindness of Mr. C. L. Winey we are enabled to reproduce the "Report of the Committee on Cars to the Direction of the South Carolina Canal & Railroad Co." The title is somewhat misleading, as the report has more to do with the early locomotives of that road than what we today understand as "cars". The photographs that accompany this report were also furnished by Mr. Winey, and are reproductions made from the original drawings of these locomotives.

Report of the Committee on Cars to the Direction

of the

South Carolina Canal & Railroad Company

Submitted to the Stockholders on Wednesday, 20th Nov. 1833.

The Committee on Cars, to whom was referred the several Resolutions of the Stockholders, requiring information on the following points, viz:—

1st. What is the cost of each Locomotive, and from whom bought.

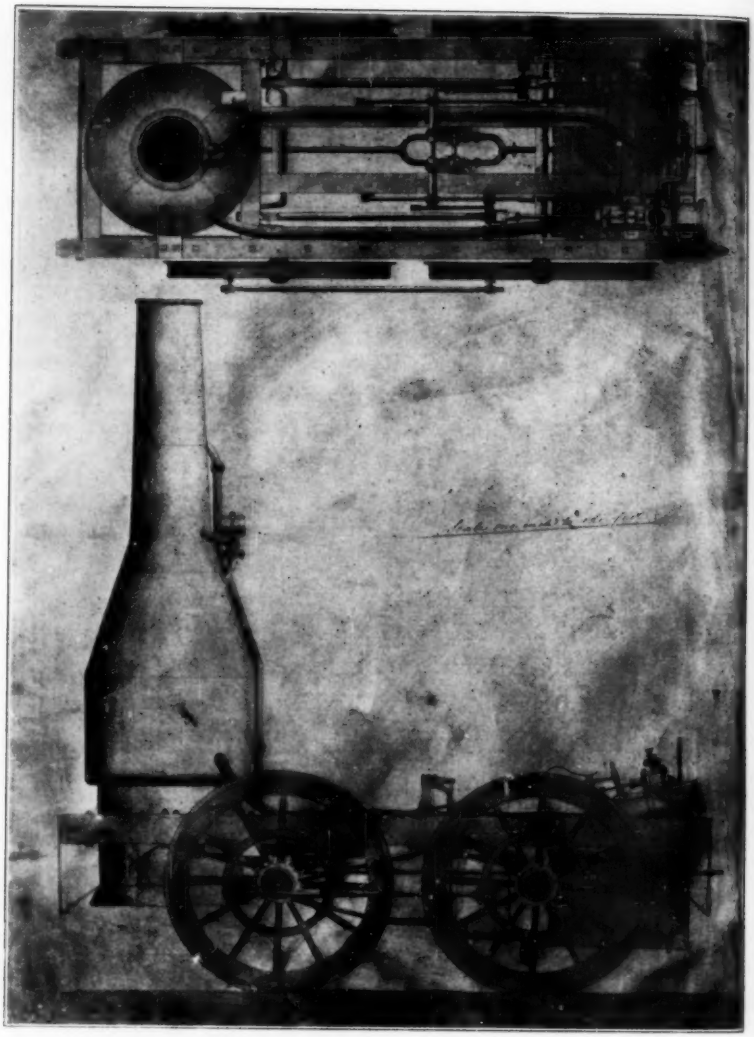
2d. The time of arrival of each Locomotive from the period when contracted for.

3d. State the performance of each Locomotive on the Road.

4th. What derangements have taken place in the machinery and the causes of such derangement, so far as has been ascertained whether from bad materials, bad workmanship, or defect in the principle of construction.

5th. Have any, or what Locomotives, been constructed on the plan of the English Engines, and what has been the comparative performance of such.

6th. Have not the Locomotives heretofore received been generally constructed upon the plan of English Engineers, but with *supposed* improvements, suggested by our Engineer; and have not such supposed improvements already failed in several instances.



Copy of the Original Drawing of the "Best Friend."

7th. How many of them are now in use, and how many laid by for repairs.

Beg leave to report, that they have bestowed the best attention to the subject, that the limited time and other circumstances would permit. The Committee handed a copy of the subject matter referred to them, to the Chief Engineer, in order to obtain from him such information as would aid them in their deliberations. The Committee also entered into a minute examination of the Master of the works, the several Engineers charged with the management of the four and eight-wheel Engines, and the superintendent of the repairs of the Road, with the view of embracing more fully the obvious purport of the Resolutions. The Committee submit the following replies to the queries.

To the 1st, 2d, 3d, 4th and 7th.

The following statement contains the names, contract prices, time when due, and time when put to work, of the several engines employed on the Road:

Received Dec. 1830, 1. Best Friend, 4 wheels, $4,000.00, due June 1830, put to work Dec. 1830.

Received April, 1831, 2. West Point, 4 wheels, $3,250.00, due Jan. 2, 1831, put to work July 15, 1831.

Received Jan. 1832, 3. South Carolina, 8 wheels, $5,000.00, due Jan. 15, 1832, put to work Feb. 24, 1832.

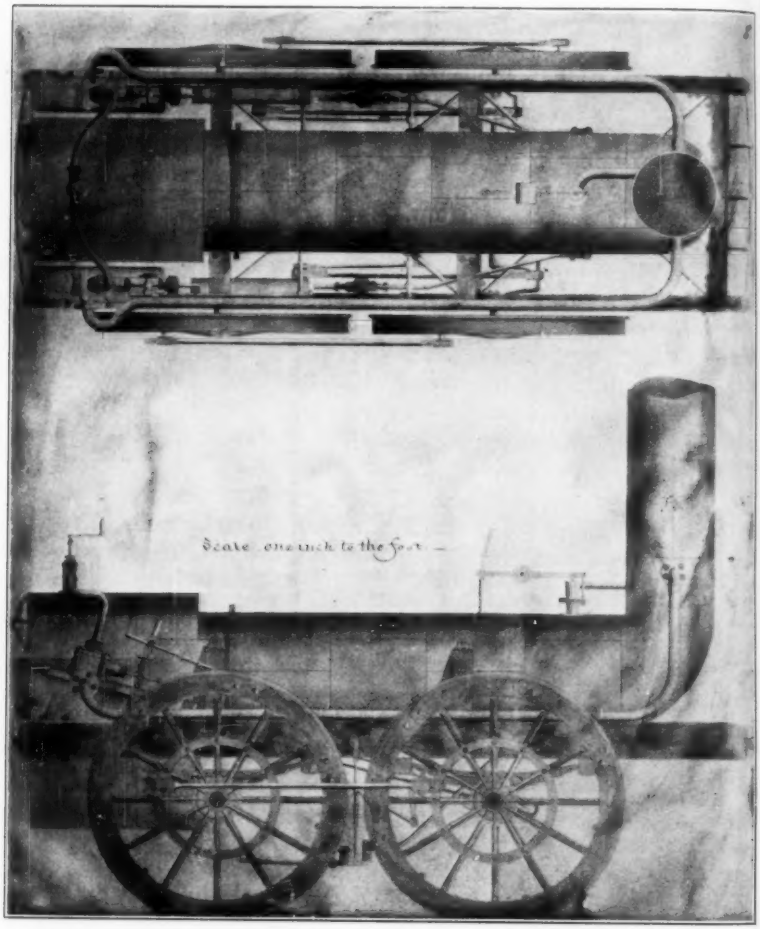
Received March 1833, 4. Charleston, 8 wheels, $5,750.00, due Jan. 15, 1833, put to work Sept. 1, 1833.

Received June, 1833, 5. Barnwell, 8 wheels, $5,750.00, due Feb. 15, 1833, put to work June 15, 1833.

Received Sept. 1833, 6. Edisto, 8 wheels, $5,750.00, due March 15, 1833, put to work Sept. 11, 1883.

1st. *The Best Friend* had its boiler destroyed by explosion, June, 1831. Her cylinder and working parts were made use of in the construction of the *Phoenix*, built by the Company in Charleston, the boiler of which is on the principle of the *Best Friend*. The arrangement of the machinery and boiler is different, having the cylinders working outside, and the weight much more equally distributed. This Engine was put to work 18th Oct., 1832.

2d. The *West Point* was removed from the Road 4th June 1833, for the purpose of introducing an outside arrangement of her machinery, similar to that which has proved so successful



Copy of the Original Drawing of the "West Point."

in the Phœnix. This required a new frame, otherwise much wanted, and new wheels. The wheels have at length been re-

ceived, and the axles are expected daily; the other work is considerably far advanced, but in consequence of a want of hands, nothing has been done on her for a considerable time,—the work is now resumed.

3d. The boiler of the *South-Carolina* failed 27th Dec. 1832, and the Engine not replaced on the Road until the 10th Aprii 1833, when, after an ineffectual attempt to use her for some weeks, it was found necessary to construct new frames which had always been too slight, and to alter the part of the boiler over the fireplace according to the plan adopted in the new eight-wheel Engines, for which purpose the Engine was taken off the Road on 8th Sept. 1833, and it has not yet been in our power to effect this object, not having had a sufficient number of men to do much to her. Previous to the failure of the boiler, much trouble and delay had arisen from the breakage of her pipes, which difficulty was, however, completely overcome; and from the use of cast iron and wooden wheels which failed repeatedly but have now been replaced with cast iron wheels with wrought iron tires. Her axles too, were constructed of a much less perfect material and plan, and were broken several times. In replacing her on the Road, no alteration is contemplated in the principle, it having given great satisfaction, and the working parts and arrangements having never failed in the least.

4th. The *Charleston* was received in April 1833, but the boiler requiring and receiving additional workmanship on the part of the manufacturers, the Engine was not put to work until the time named, Sept. 1833. This was the Engine erroneously supposed to have failed in consequence of her small flues, but in fact the difficulty of her draught was entirely removed by making the smoke-stack and discharge pipes as they were originally directed to be. Very considerable work has been done on this Engine by the hands of the Company, but chargeable to the contractor. It has been found necessary to make more perfect connections between the frames and axles of this Engine, and it has been done most effectually. Much trouble has been had with this Engine, from the inadequate strength of her valve gearing, and it is intended to replace it with stronger as soon as it is in our power to do so.

5th. With the *Barnwell* there has been similar difficulties with the valve gearing, but not to so great an extent, as they are

better proportioned although not strong enough. The pumps of this Engine have not always worked well, and when the use of water containing much sediment, rendered them still more inefficient, the flues were injured by permitting the water to get too low, and eventually, after an injudicious continuance to run her after a failure to supply, the flues were so much impaired by the heat as to render it necessary to have them taken out. The flues being large ones were put in with collars, and it has been necessary to take the boiler apart to put in new ones. The Engine has been off the Road since 20th Sept. 1833. Her new flues have been received and will be put in with rings which will allow any tube to be replaced with little delay or trouble. The repairs will now go on as fast as our force will permit.

6th. The *Edisto* has performed very satisfactorily with the exception of breaking one of her wheels (in the centre of the hubb) and two of the sidelegs which support the boiler. It is supposed that the wheel received some extraordinary strain, as other wheels of the same construction have with the other Engines, given great satisfaction. The valve gearing of this Engine is better proportioned than any of the others, but even in this, is not of that excess of strength which renders liability to failure exceedingly improbable.

To present at one view the manner in which the Road has been supplied with Engines for successive periods since the running of the West-Point alone on the Road, from June 1831 to Feb. 1832, when the South Carolina commenced running, we have as follows:—

Feb. 24, 1832 to Oct. 18, 1832, 8 months, 2 Engines, West Point and South-Carolina.

Oct. 18, 1832 to Dec. 27, 1832, 2 months, 3 Engines, West Point and South-Carolina, Phœnix.

Dec. 27, 1832 to April 10, 1833, 4 months, 2 Engines, West Point and Phœnix.

April 10, 1833 to June 4, 1833, 2 months, 3 Engines, Phœnix, South-Carolina, West Point.

June 4, 1833 to Sept. 1, 1833, 3 months, 3 Engines, Phœnix, South-Carolina, Barnwell.

Sept. 1, 1833 to Sept. 11, 1833, 10 days, 3 Engines, Phœnix, Barnwell, Charleston.

Sept. 11, 1833 to Sept. 21, 1833, 10 days, 4 Engines, Phœnix, Barnwell, Charleston, Edisto.

Sept. 21, 1833 to Nov. 20, 1833, 2 months, 3 Engines, Phœnix, Charleston, Edisto.

It must be borne in mind in looking at the above list that all that have ever been put to work on the Road, have been considered as at work with the exception of the S. Carolina taken off on account of failure of boilers, Dec. 27th 1832, and again taken off, boiler being still unsound, and new frames required, Sept. 8, 1833. Of West Point taken off to introduce new arrangement and frame, June 4, 1833. Of Barnwell taken off on account of injury to flues, Sept. 21, 1833.

The *Hamburg*, a four-wheel Engine constructed by the West-Point Foundry association, according to the plan adopted by them from the one used on the Camden and Amboy Road, which are after the approved English Engines, with some alteration in her boiler, with a view to a more equal distribution of the weight, was received Oct. 1833, but is not yet put to work as one of the Engines on the Road, its axle having failed in the first three trials of the Engine.

We thus have at work,—The Phœnix, 4 wheels—the Charleston, 8 wheels—the Edisto, 8 wheels.

We are deprived of the use of West-Point by necessity of new arrangement and frames. S. Carolina by necessity of new frame and perfecting boiler. Barnwell by replacing flues burned by accident. We hope to add the Hamburg in a few days for the transportation of freight at slow speeds.

To the 5th. The West-Point and Hamburg have been constructed on the plan of the English Engines. The performance of the first has been one-third to one-half of those of the eight-wheel Engines. it is believed that the Hamburg is capable of performing one-third more than any of the eight-wheel Engines. The operation of both these Engines has been very severe on the Road, and every Engineer as well as all persons in charge of the Road, unite in the opinion that it would be highly injudicious to use such Engines.

To the 6th. The eight-wheel Engines differ from the English Engines in plan of boiler, manner, and number of supports, arrangement and application of power, and in the attain-

ment of an equal distribution of the weight, it has been in parts which are common to the two Engines, and which are under similar circumstances that all our trouble has been experienced, and in the *supposed* improvement that we have obtained an Engine possessing very important advantages, and in the use of which every Engineer on the Road has become their decided advocate, as will appear more fully from other documents herewith communicated.

The Committee, having concurred with the Chief Engineer in the opinion that mere answers to the above queries would not fully embrace what is evidently the object of their being made, authorised at his request an examination into the results of experience as derived from our Road.

With this view the Committee have attended an examination of the persons, who having been employed, and in charge of the management and repairs of the Engines used thereon, are practically and intimately acquainted with all the circumstances, their experience, therefore, is of essential importance in forming correct opinions in relation to them.

The individuals examined were, Mr. Petsch, master of the workshops, who having had charge of all the Engines, is, in profession, of much valuable information and experience on the subject.

Mr. Darrell, who has been the Engineer of the Best Friend, (four-wheel.) The West Point, (four-wheels,) South-Carolina, (eight-wheels,) and Charleston, (eight-wheels,) and has occasionally run all the others. Mr. McCandlish, who was the Engineer of the Barnwell, and who has run the Charleston. Mr. Robertson, who has had a long experience with the four-wheel Engines on the Liverpool and Manchester Road, and brings recommendations of the first character from the Engineer of that work, and was sent to this country with one of Mr. Stephenson's Engines. On our road he has run the Charleston, eight wheels, and Phœnix, four wheels, and occasionally the other Engines. Mr. Cummings, who for eighteen months run four-wheel Engines on the Liverpool and Manchester Road, has run a four-wheel Engine on Camden and Amboy Road, and a six-wheel Engine on the Susquehanna Road. On this Road he has run the Charleston and Hamburg.

Mr. Allison, who has been the Engineer of the West Point

and Edisto, and has run the others, not being in town, the statements were submitted to him and fully concurred in. Mr. Raworth, who has been Engineer of the Phœnix,and made a few trips on the other Engines, was also absent on the Road, but expresses his accordance with the statements made.

The following is an abstract of the testimony brought before the Committee:—

1st. As to the expediency or necessity of attempting to run eight-wheel Engines. Were there any circumstances which renders it practically necessary or expedient to introduce them? If so, what are they? and has experience on our own or other Roads, confirmed or fulfilled the views which led to that measure.

Mr. Petsch, Mr. Darrell and Mr. Allison, are the only persons of those named who have practical acquaintance with the circumstances at the time, and they unite in the opinion that such circumstances did exist, and that it was highly important that something should be done in consequence of them; that the circumstances were the severe effect of the four-wheel Engines on the Road; and the experience of all the persons, either as derived from our own or other Roads confirm most fully the views which led to the introduction of the eight-wheel arrangements.

2d. As to the propriety of postponing orders for English Engines. Did or did not a practical consideration of the same circumstances render it injudicious to use four-wheel Engines of the usual English construction at that time?

As far as their experience bears on this question it confirms the views of inexpediency of using such Engines at all.

3d. As to the attainment on the eight-wheel Engines of the object aimed at, have the eight-wheel Engines been successful or otherwise in meeting the difficulty anticipated, and in possessing the qualities for which they were attempted?

The testimony is unanimous and decidedly in the affirmative, showing that extraordinary ease of motion has been attained, such as has never been approached in a four-wheel Engine, and that the result is of high practical value to the Company.

4th. Are any, and if so, what of the difficulties which have attended the use of eight-wheel Engines, to be attributed to them as *eight-wheel Engines?*

With the exception of some temporary trouble with the steam-pipes of the South-Carolina, which were effectually removed, the uniform reply was, *none*.

5th. Would the same description of workmanship, proportion of parts, and arrangements have produced the same failure and disappointments with four-wheel Engines, as have taken place with the eight-wheel ones?

The reply was by all in the affirmative, and probably greater.

6th. Are the eight-wheel Engines more complicated than the four-wheel ones, as ordinarily constructed?

The statement is, that they are not.

7th. Are the eight-wheel Engines more or less easy of access or repair, either when running or standing still, than the four-wheel ones?

They are much more easy of access and repair in both cases.

8th. What have been the causes of failure and difficulties?

They have been independent of the principle of an eight-wheel Engine, and have originated in unsound materials, imperfect workmanship and especially from the inadequate proportion of the working gearing to the strain which they were fairly and necessarily subjected to. In the three eight-wheel Engines last put on the road, double valves, similar to those employed on most of the Engines, on the Liverpool and Manchester Road, were used, the resistance from these valves, with the pressure of steam which our Engines work with, has been too great for the valve gearing attached to them. With these Engines there has also been much trouble from the imperfect operation of the pumps, partly attributed to bad workmanship, partly to inattention to keeping them in thorough working order, partly from being compelled to use the Engines, with the pumps not in good order or only one pump, and partly from the necessity of using water, when the wells were low, containing much sediment. A large portion of the continued difficulty has been occasioned, by being compelled to run the Engines with an imperfect repair, instead of thoroughly correcting the cause of failure, from the exhibit of the Engines on the Road at sundry periods, it will be apparent how inadequate from causes entirely independent of principle or plan, and of our control, have been the number of Engines on the Road, to the demands made on

them, and consequently it is evident why it has been found necessary, rather repeatedly to repair them, than to remove thoroughly the cause of failure, the latter would have required time, which our engagements would not allow, and rendered immediate repair and use essential, to these causes must necessarily be added, those existing in mismanagement, inattention, extraordinary strains from wrong position of gates and crossing rails, injudicious speeds and similar sources not easily provided against, especially under our peculiar circumstances, and with new machinery and men inexperienced in its management.

9th. As to the effect which experience has had on the original and present operation as to the eight-wheel Engines of the persons examined.

They were all originally unfavorably impressed as to the eight-wheel Engines; but notwithstanding all the attendent trouble, experience in their use has led to a decided preference of them, and to an unanimous opinion, that none other should be used on any road constructed of wood and iron, and to the belief that they will eventually be adopted on all Rail-Roads.

Although not embraced in the immediate objects of the Committee, it was thought proper to take advantage of this opportunity to ascertain as far as the practical views of the persons before the Committee was of value, what were in their opinions the principal evil with the arrangement of machinery, as is found existing in both eight and four-wheel Engines. The reply was, in having the working gear out of view, and access of the Engineers when the engine was in motion, and in having the direction of pistons and pumps horizontal, which renders it almost impossible to keep the parts well oiled, and when combined with difficulty of access, occasions a very great waste of oil; and that the correction of these evils would be of great practical value, especially on a road where so long a line of continuous motion is required.

On a plan being submitted and explained, which had in view an arrangement of the machinery of an eight-wheel Engine, expressly intended to remove these objections, and embracing some other advantages believed to be of great value if they can be attained. The opinion was general that it would be successful, and that both the objects to be attained, and the

probability of success, were highly in favor of such an arrangement.

On reviewing and comparing the above statements, it will be perceived that, in no instance have difficulties or derangements in the machinery arisen from the fact of their being eight wheels to the Engines. Nor has the principles on which the eight-wheel Engines are constructed, had any agency in producing the evils complained of; but on the contrary, the same results to a more injurious extent, would have occurred to Engines on four wheels, if constructed with the same defects of proportion and workmanship. It appears clear to the Committee, that eight-wheel Engines do not contain in themselves, either from any new principle introduced, or from the necessary arrangements of their parts in construction, the elements of self-destruction, to any greater degree than the four-wheel Engine, nor do they effect the road as violently.

If, then, the conclusion be clearly established, that important advantages have been attained by the eight-wheel Engines, that they are peculiarly adapted, and indeed indispensably necessary to the preservation of the Road, and that the results anticipated are more than realized, it would appear to be a useless task to go into an examination of the causes which induced the Board originally to concur with the Chief Engineer in giving them a preference.

It might be sufficient for the Board to point to the results, and rest on them for their justification. They will, however, briefly advert to the state of things then existing.

At that time, there were eight or nine English Engines in the United States, which had been imported by different Companies; four of them had been ordered for a road similar to ours in plan and material. The first trial on this road proved so seriously injurous, literally shaking its parts asunder, and breaking down the rails, (as was witnessed by one of your Committee) that a total abandonment of steam power was immediately resolved on, and the road was prepared at a great expense for the use of horse power. Two of the others were imported to be used on roads constructed of Iron rails, on a Stone foundation; their performance had not been tested at the time our Board were compelled to decide on the plan and character of their Locomotives; and also, whether they should be obtained

at home, or from abroad, it was subsequently ascertained, that in order to render them effective, the number of wheels were changed from four to six. In addition to these facts, the Board had the example of the Baltimore and Ohio Company, which combined a greater amount of talent, wealth and expense, than perhaps any other similar corporation in the nation. Many of the leading Stockholders in this Company, were prejudiced in favor of English Engines; from their connection with English commercial houses, they were enabled to obtain the most accurate information on the subject; yet with all these advantages, we find them, after mature deliberation, offering premiums and other inducements to the American manufacturers, to engage in the construction of Engines, rather than risk their importation from abroad.

All the accounts from England concurred in stating the expense of repairing Locomotives, and that not more than one-third of those owned by the Liverpool and Manchester Company, were fit for work at any one time, while at the same period. "The Best Friend," (the Pioneer of American Locomotives,) and the "West-Point," both of American manufacture, were worked with success upon our Road.

Such was the nature of the circumstances, and the extent of the information possessed by the Board, when they were called on to decide on the character and extent of the Locomotive power to be introduced on the Road. The valuable improvements which genius, aided by the light of experience, has subsequently produced, being then unknown, of course afforded no aid to the Board in making their decision. Governed in their opinions by the facts which had at that time come to their knowledge, they authorized the construction of four 8-wheel Engines, instead of six, as recommended by the Chief Engineer, leaving it optional with that gentleman to contract for them at home or abroad. A highly advantageous engagement was made with N. Bliss of New York, by which his extensive works and experienced hands were placed at the disposal of our Chief Engineer; under whose immediate direction and supervision the Engines were to have been constructed. Scarcely, however, had this arrangement which promised such satisfactory results been commenced, when the Cholera made its appearance in that city, and raged with peculiar violence in that section of it in which Mr.

Bliss' works were situated. A total desertion of the workmen, and the utter ruin of the employer, was the consequence. Mr. Allen then applied to the Board for permission to proceed to England forthwith, as the measure best calculated to remedy this disappointment, and to place the Engines at our command, in the shortest time, and on the best terms. Important as these considerations were, there were others that, in the opinion of the Board, were even more so, viz., The presence of the Chief Engineer on the line of Road, and his personal supervision and direction in its construction. Under these circumstances, this Board authorized Mr. Allen to contract for the Engines at the North, on the best terms he could obtain. Under these instructions, Mr. Allen entered into a contract with the West-Point Foundry. This contract was made at a time, when from the great demand which existed for that species of work, and the few establishments which could furnish it, on account of the dispersion of their workmen by the pestilence, that the manufacturers were enabled, in some measure, to prescribe their own terms, and indeed seemed rather as conferring a favor than receiving a benefit, by the acceptance of our work.

Your Committee, although they may have already extended their remarks to too great a length, cannot quit this part of the subject, without bringing to the view of the Board, a part of the evidence which they conceive has a direct and important bearing on the inquiry, "*What has been the cause of derangement so far as ascertained.*" Your Committee have special reference to the great velocity at which the Engines have moved with heavy trains of Cars attached, and would, without hesitation, assign this as a prominent cause of injury both to the Road and to the Engines. Every witness questioned on the effect produced on the machinery by great rapidity of motion, unhesitatingly replied, that it was highly injurious. Indeed, it requires but a slight daily observation to convince any person, "that a series of shocks constantly repeated on machinery of so cumbrous a mass, so delicately adjusted in its parts, and so heavily strained as a Steam Engine, must greatly injure and rapidly destroy them."

Mr. Allen, in his communication of the 29th January, 1831, distinctly recommends that the speed of the "West-Point;' be limited to ten miles per hour, without regard to the number of

Cars in the train. Mr. Stephenson, in reply to the enquiry made by the President of the Boston and Lowel Rail Road Company, viz. What do you consider the economical rate of speed at which Locomotives should travel? States that they should not exceed eight miles per hour with freight Cars, nor sixteen (16) miles per hour with passengers, the latter speed yielded to, not from considerations of economy or durability, but solely to gratify the public in their wishes for rapid travelling. Mr. White, the gentleman who projected the Munch Chunch Rail Way, and under whose directions it was constructed, thus expresses himself:—"The motion of twenty or thirty miles per hour, on Rail-Roads, will be fatal to wagons, loading and road, as well as to human life." "Our first two months use was fifteen to twenty miles per hour; which would soon have ruined both road and wagons, and was, I am pursuaded, much dearer than the turnpike on which was laid the rails."

The Liverpool and Manchester Company, after having experienced the injurious effects of rapid traveling, and been made sensible of its inexpedience where it was most sensibly felt: (in the Revenue of the Company) have lately decreased the speed of the Locomotives upon their Road. The item for maintenance and repairs of Locomotives, for six months ending July 1st, 1832, was £10.582, which, with the repairs to the Road, made an annual expenditure of £35,000 sterling money. At a time when it was represented that out of twenty four Engines, not more than six or seven were in working order, the others undergoing a thorough repair. The item charged in the semi-annual report to July 1833 "for repairs of machinery" is £12,000 for the preceding six months. From which it appears, that the working and repairs of the Locomotives on the Liverpool and Manchester Railway, cost annually about £24.000. or in other words, the startling sum of *£800 per mile per annum, for every mile of their line of road.

While on the subject of the cost of machinery, repairs, &c. it is deemed proper to correct an erroneous impression which has generally prevailed, in relation to a statement, in the accounts of the Company, submitted at the last meeting; by which it would apear, that the wages of the hands employed in the work-shops, amount to $28,204.14.

This item has been generally, though improperly supposed

to contain the amount paid for repairing and keeping in order the running machinery on the Road, when in fact, it includes the salary of the several Engineers charged with the superintendance of the Locomotives, of the hands attached to the several trains, the wages of the laborers engaged in loading and unloading the freight cars at the Depository; to which it may be added, that the work executed in the work-shops has been of the most miscellaneous character, embracing the construction and fitting up of passenger and freight cars, iron work for the passing places, sliding sections, and revolving platforms throughout the line; clamps, bolts and braces for the Edisto Bridge and Stationary Engine, with a variety of other jobs too numerous to mention.

No account has been kept of the separate performance of each Locomotive, so far as to enable your Committee to form an estimate of the work done by each, and the amount of expenses chargeable to each. Such an account would be satisfactory, as it would furnish valuable data, by which the relative value of each could be fully estimated.

The cash receipts, is not a fair criterion, as it forms but a part of their actual performance.

The annexed statement marked E, is an estimate of what it would have cost, for the transportation of material to construct the Road at the Rail-Road price of transportation; which although not money that *came* in, was certainly money *kept* from *going out*; if *not made* it was evidently *saved*; and is justly creditable to the Engines.

The statement annexed and marked D, exhibits the performance of the Engines from the 1st of June, to the 18th of the present month.

The statement marked F, contains an account of the Passenger and other Cars, added since the meeting in May.

By reference to the books at the Depository, it will be seen that the performance of the Engines, since the meeting of the Stockholders on the 4th to the 18th of the present month, has been as follows:—

Phœnix 4 trips ascending and 4 descending with Passengers	$ 1286.50
Charleston, 2 trips ascending and 3 descending	

Freight	$226.79	
Passengers	$648.44	
		875.33
Edisto, 2 trips ascending and 1 descending		
Passengers	$531.75	
Freight up	180.00	
ditto down,	115.67	
		827.42
		$2,989.25

The return trip of the Edisto on last Saturday and the upward trip on Monday in Freight and Passage money amounted to $620.

All of which, is respectfully submitted, with the Unanimous concurrence of the Committee,

ALEXANDER BLACK,
Chairman of Committee on Cars.

Charleston, 19th Nov. 1833.

At a meeting of the Board on the 19th inst., Resolved unanimously, That, that the above be accepted, and laid before the Stockholders at their next meeting.

JOHN T. ROBERTSON, *Secretary.*

*Notwithstanding this immense expenditure for repairs this Company has declared a dividend of 8 Guineas per share equal to double the usual interest of the Country.

TABLES.

D.

STATEMENT of the Locomotives, on and off the Road, from the 1st of June to the 18th of November, both included.

RECAPITULATION.

SOUTH CAROLINA—From 1st June to 7th September, on the Road 47 days; Off the Road 52 days, 99

CHARLESTON—From 1st June to 18th November, on the Road 37 days; Off the Road 134 days, 171

Not entered for regular work till 1st day of September. The time chiefly occupied in new modelling and alterations.

BARNWELL—From 10th June to 20th September, on the Road 80 days; Off the Road 23 days, 103

EDISTO—From 8th September to 18th November, on the Road 26 days; Off the Road 45 days, 71

PHOENIX—From 1st June to 18th November, on the Road 150 days; Off the Road 21 days, 171

During the above time, she has occasionally performed double duty.

HAMBURG—Three Trips on Trial, and taken off the Road.

E.

The Locomotives have transported the following materials for the use of the Road.

Fifteen hundred tons Iron, value in freight, at 7c per ton per mile	$ 7,500
Seventy-five tons spikes, value in freight, at 7c per ton per mile	350
Fifteen hundren tons Timber, at an average of 10 miles	1,050
----------tons of Fuel for use of Engine,	$ 8,900
Workmen, back and forwards, Provisions, Machinery for Inclined-Plane, Revolving Platforms, Pumps, &c. equal to and including Contractors and their Agents, Provisions, Tools, &c., assumed,	12,500
	21,400

The land transportation and conveyance by water, attendant on the above, would from the difference of value between the rates paid, and those charged, have augmented it to $64,200, or thrice the amount estimated.

F.

Statement of Locomotives, Passage, Crank, Freight and Tender Cars on the Line and at the Depository, made since 1st day May, 1833.

2 Eight Wheel Locomotives,—Barnwell & Edisto.
1 Four Wheel Locomotive,—Hamburg.
3 Improved Passenger Cars.
4 Improved Passenger Cars.—Ready for mounting.
10 Improved Passenger Cars.—On hand. (Not finished.)
1 Crank Car.
40 Freight Cars. (Completed.)
28 Freight Cars. On hand (Not finished.)
5 Tender Cars, with Butts.
9 Tender Cars with Water Tanks.
24 Covers for Freight Cars.
Repairing Freight and Passage Cars at various times.
1 Baggage Car, ready for mounting.

JOHN GROSS, *Clerk of Works.*

Charleston, 18th Nov. 1833.

3 Freight Cars, burned on the Road.
1 Improved Passage Car, broken to pieces on the Road.
1 Old Passage Car, broken to pieces on the Road.

Early Locomotive Building in Lowell, Mass.

Read by Edwin R. Clark before the Lowell Historical Society.

The first quarter of the nineteenth century, while more historically prominent for its international disturbances, was remarkable in a much worthier sense for the great interest in mechanical developments, especially in respect to methods of transportation. By the beginning of the second quarter of the century the interest had crystallized into the organization of several railways and shops for the production of necessary equipment.

In the United States the first real serious steps in forming a railroad for general traffic were taken by the Baltimore

and Ohio R. R., chartered in 1827 and practically opened for business in 1830.

In England the proprietors of the Manchester and Liverpool railway were before Parliment in 1825, facing much incredulity and opposition, but finally received the governmental sanction and immediately proceeded to construct its track connecting the great textile city and the seaport.

The possibilities of the tractive usefulness of steam had become apparent early in the century, but as a commercial proposition was largely confined to the coal mines of England where by 1813 crude, low speed uneconomical locomotives were scarcely convincing mine owners of their practicability.

It became the fortune of a man of humble birth and slight education to so direct his genius that an increased interest in steam traction opened the way for his experiments and by 1815 George Stephenson was demonstrating a machine possessing much more power and flexibility than any previously operated.

While many great minds had so much to do in the invention and development of the locomotive, there stands undoubtedly, clearly in advance of all, this wonderful man, and this paper desires to offer in its introduction its appreciation and admiration for the humble genius that started profitable wheels rolling around the world, and whose early engines became types to be followed by other builders, including our own Locks and Canals Co.

From 1815 to 1829 (14 years) Stephenson was occupied in perfecting his engines and creating a plant for their construction. 1825 witnessed the opening of the first public railway at Stockton. The astonishing performances at that event added impetus to the public interest.

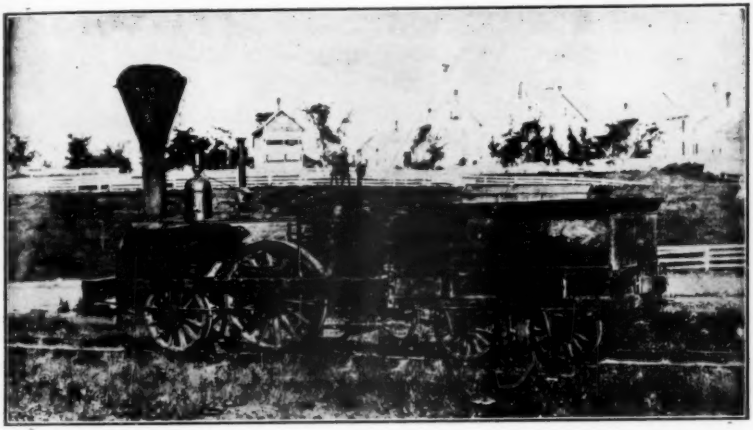
Other railways were projected and the building of equipment became of considerable importance.

The Rocket, winner of a most sensational victory at Rain Hill in 1829, exhibited very radical improvements and possessed many of the elementary features that have made locomotives practical. The boiler contained much more heating surface by virture of many small tubes, or flues, which connected the fire-box chamber with the chimney substantially as practiced ever since.

The fire box was surrounded by water, and the exhaust

from the cylinders delivered into the chimney and driving the chimney contents before it made a vacuum in the smoke box, pulling the hot gases along the tubes and causing them to give up much of their heat to the water surrounding the flues. This feature is to be esteemed as a really remarkable advance in boiler design. By transmitting the efforts of the pistons directly to the crank pins in the driving wheels the unnecessary gearings and complicated motions that heretofore characterized locomotive design were done away with.

It has not been claimed that Stephenson invented these features but no one had previously combined them in one ma-



One of the early engines received in this country from Stephenson, England.

chine and this combination reflects much credit to him for his perspicacity.

That due credit should be given to other contributing minds, the names of Trevethick who had employed exhaust steam to create draft, John Stevens of America who had experimented as early as 1804 with a tubular boiler, and Murdock who in 1784 made a direct connected locomotive for highway travel, and Oliver Evans who had demonstrated the value of high steam pressure, should be mentioned.

Stevenson's Rocket was a four wheeled machine with one

pair of driving wheels which were the leading wheels, the trailing pair being idlers.

As this arrangement involved long outside piping with loss of heat, by 1830 the form of locomotive becoming practically standard was a four wheeled machine with the driving at the rear, forward of the firebox.

In 1830 Stevenson's works delivered to the Manchester and Liverpool line the famous "Planet", which became the type followed largely both in England and this country for ten years.

The first locomotives imported by American railways were of this type, and our pioneer builders naturally accepted them as precedent.

Mr. Matthias W. Baldwin whose name stands at the head of development in this country journeyed to Bordentown, New Jersey, in order to examine the John Bull, recently received from the Stephenson works, at the request of the Philadelphia, Germantown & Norristown Railroad Company, and made measurements, sketches and memoranda of great aid in building his first locomotive.

Projects for facilitating transportation by rail started almost simultaneously in England and America. Highways which were insufficient for the conveyance of heavy loads and canals which were slow could not keep up with the demands created by rapidly expanding commerce.

In America the matter of distances became a problem that the mother country did not need to cope with to such an extent, and a lack of internal navigable water connections in a westerly direction lead industrial expansion to look longingly at the iron tracks for assistance.

Naturally a number of organizations came into existence and such a demand was created for equipment that all available machine manufacturies were urged to build locomotives.

When one considers how meager were the resources in this country for producing metals fit for the purpose and how limited blacksmiths were for forging and welding the heavy sizes of parts needed in construction, we must admit amazement that any one dared to enter the field.

It has been stated that the demand of the times would have produced a practical steam locomotive even though Watt or Stevenson had never been born, so earnestly did mechanical

minds work at the business. But the difficulties were great. It was a new problem and there were few mechanics competent to do any part of the work. It was necessary to design and manufacture an entirely different line of machinist's tools. Imagine boring out great cylinders by hand, with a chisel fixed in a block of wood. There were no blacksmiths able to weld a bar of iron exceeding one and one-quarter inches in thickness. Mr. Baldwin found it necessary to do much of the work himself in order to educate workmen and improvise tools.

Before 1830 ended, the legislature of nearly every state in the Union had granted charters for railroads and many of them were in course of construction before the year was far advanced. In South Carolina a charter for a road across the state, from east to west, was obtained in 1827.

The Delaware and Hudson Canal Company entered the field as a steam railroad in 1828.

The Erie Railroad was projected soon after, and in 1833 the Baltimore and Ohio had shops for building locomotives at Mount Clare.

While Mr. Baldwin declared that the Old Ironsides his first locomotive would be his last one, by 1834 he had made five, and in October 1839 he delivered his 136th locomotive.

In New England, locomotive building had its first production in Souther's shop in South Boston. Soon after this, in 1834, the Locks and Canals Company of Lowell entered the field, owing to prostration of their canal operations due to the rapid growth of steam transportation.

The company adopted Stephenson's Planet type for this model and built quite a number of them for different railroads, mostly for those in New England.

The Locks and Canals Company was chartered in 1792 with the Hon. Jonathan Jackson as its first president. Its purpose was to construct a canal around the Pawtucket falls that transportation in the river might be facilitated.

The canal was built under the supervision of Thomas M. Clark of Newburyport, and due to his energy and fidelity was opened for traffic October 18, 1796, about four years from its inception. The canal cost about fifty thousand dollars and proved a practical success although it paid only about four per cent dividends annually.

In 1821 however its usefulness began to appear in other ways as it furnished water power for the manufacturing enterprises that were attracted by it, and the prosperity shifted from the Newburyport control to the hands of the Boston capitalists engaged in the new textile enterprises, retaining however its original name.

In 1882 the shares of the original company having been acquired by the Merrimack Manufacturing Company thereby and therewith transferring all the rights and privileges of the old company to the new Owners; the Merrimack Company for two years operated the affairs of both concerns as one company, but at the end of two years it appeared better to re-establish the Locks and Canals Company giving over to it the jurisdiction over all lands and water power and machinery manufacturing belonging to the company, and retaining only textile manufacturing operations. The legislature sanctioned this reorganization in 1825 and the Locks and Canals Company to the present time exists under the charter of 1792. Among its agents have been Kirk Boott, Joseph Tilden, William Boott, James B. Francis, James Francis, Hiram Mills and its present worthy leader Mr. Safford.

James B. Francis, a native of Oxfordshire, England, became a railroad and hydraulic engineer by right of heritage and at fourteen years of age was employed in that service upon the harbor works of Porth Cawl and the great western canal.

At the age of eighteen he came to America and found employment under George W. Whistler, a distinguished engineer who was running the surveys for the New York, Providence and Boston R. R.

The following year Mr. Whistler was employed to build locomotives for the Boston and Lowell R. R. as well as to construct locks for the Locks and Canals Company, moving to Lowell and bringing Mr. Francis with him.

The coming of the Boston and Lowell R. R. was largely due to the vision of Patrick T. Jackson, whose keen mind had been considering the disadvantages of the current transportation methods. Some one had started the idea of a macadamized road from Boston to Lowell and had gone as far as to partially survey and estimate for it.

Tidings however, reached this country of Stephenson's

success with the steam railroad and Mr. Jackson made up his mind that it was that line they must look for future development. He was then fifty years old, and it was but ten years since he had established the first of the great American cotton mills. With his usual zeal, we read, he started the new interprise and its success and usefulness are matters of familiar record.

Of Mr. Whistler it remains to be said that his connection with the Locks and Canals Company, during which time he manifested the highest skill, was mostly concerned with the building of the first locomotives for the Boston and Lowell R. R., the fame of which brought demands for his services from other roads in New England and the west. Being sought by the Emperor of Russia to become consulting engineer of Railroads he accepted and remained in Russia until he died in 1849.

The building of cotton machinery was first begun by the Merrimack Manufacturing Company early in 1826, as England was imposing stringent laws against export of such machinery. The Company erected a four story building for the purpose, and then transferred this occupation to the Locks and Canals Company with the other machinery production included in the re-establishment of the latter Company.

When the locomotives for the Boston and Lowell Company were finished they accepted tenders for others from the Boston and Maine, the Nashua and Lowell, Western Massachusetts, Providence and Stonington, and Marietta and Columbus, which apparently established this industry on a considerable scale in Lowell.

In April 1845 a new Company, with the title of the Lowell Machine Shop was incorporated which purchased the machinery plant of the Locks and Canals Company, continuing to operate it to the present time.

The original incorporators were Abbott Lawrence, Nathan Appleton and John A. Lowell. The original capital was $500,000.

Mr. Charles L. Hildreth succeeding previous incumbents in 1879 made an enviable record during long years of association with the Company.

Among the various superintendents of the Lowell Machine

Shop the name of George Brownell is prominent and quite vitally associated with the subject of this paper.

Mr. Brownell was born in Portsmouth, Rhode Island, Aug. 8, 1793, he was of English origin, and after leaving school became engaged in machinery production at Waltham and Fall River. He came to Lowell with Paul Moody, becoming superintendent of the machinery department, which position he held until 1846.

As this period was one of inception and development much perseverance and inventive skill was necessary, but we read that Mr. Brownell proved untiring in his services.

In order that the company might avail itself of all the information and data obtainable abroad and also purchase tools and material, Mr. Brownell was commissioned to visit England and Scotland devoting himself to the most thorough investigation of shop methods, machinery, iron forging and casting, and design and manufacture of machine tools and locomotives.

This he went about in characteristic manner. The following extracts from his diary are indicative of his experiences in England.

Extracts from the journal of Mr. George Brownell.

Left Lowell for Fall River Feb. 13, 1839, at 5 o'clock P. M. Left there on the 15th for Stonington via Providence arriving there about 5 o'clock. Left Stonington Saturday evening in the steamer Narragansett a fast boat. Slept but little on account of the laboring of the boat through the ice. Arrived at New York about 9 o'clock Sunday morning. Went to see the steamer Great Western and liked her general appearance but did not go aboard. (Mr. Brownell returned from Europe on this steamer.)

Tuesday 19th, took breakfast early, called on friends and went on board ship at 11:30 and at 12:00 the ship in tow of a tug started for sea.

At noon Wednesday 20th, 147 miles from Sandy Hook, felt uneasy, ship rolling, wished I was ashore or had waited for Great Western. No help for us, took some more Porter, felt better and went to bed and slept well. Captain a Massachusetts man very fond of Johnny cake and pudding, codfish and potatoes, fritters and molasses.

Thursday Feb. 28, wind ahead and not much of it, dark and foggy, captain informed large iceberg close at hand. Fog lifted and all hands were on deck in a moment. Monster it may properly be called at least 60 feet high. Captain and passengers much alarmed. Ship liable every moment to strike berg, but in about half an hour sailed clear.

March 2, 4 A. M. Wind west blowing a gale. Shipped a number of seas some very large. Very interesting sight to see sailors reefing, sometimes dipping into the sea and then the ship rolling other way carried them much higher than I care about going.

Tuesday March 12, at 4 o'clock, land ho, came in sight of a steamboat bound for Dublin. Nearly all passengers decided to go aboard of her to reach Liverpool sooner. Sea very high and dangerous more so than I expected. Nearly swamped but arrived safely on steamer. Arrived at Dublin at 8 P. M.

Arrived at Liverpool at 10 o'clock A. M. Friday 15th and Saturday 16th went with Mr. Thornley to see Mr. Hartley, a very clever straight forward engineer who showed us his works, promised us some letters, said we were doing work to a better advantage in our country than he was and almost made me believe it. His blacksmith's shop is not so good as ours, his fires are "blowed" by men and is obliged to have two men to every five, had one large trip hammer which I thought to be very good. He makes some iron from scrap which he says is better than he can buy. Has shears and a punch, some very good lathes and a small steam engine.

Mr. Hartley sent one of his men with us to see Mr. Forrester's works, the Vauxhall Foundry. Mr. Forrester looked at us rather hard but finally admitted us through his works in a hurried manner about dinner time. I did not see his foundry He has a large shop for building engines for steamboats and locomotives. He says the locomotive business he does not like. His last pattern for locomotives is very much like the drawing we had sent from New Orleans being for six wheels with driving wheels in centre, straight axles, cylinders outside of course, didn't like crank axles. Cylinders 13″ with 18″ stroke, nearly the whole boiler covered with wood. Tyres 1½″ thick when finished. The work on the engine well finished. He has a large number of planing machines (six or eight), some of them

very large. He declined making any tools to sell. Employed sometimes five hundred men. Shall try to see his shop again.

Monday 18th, went with Mr. Thornley to the railroad to get some general information. Mr. Booth the treasurer, superintendent, mechanic and whole life and soul of the concern was very polite and willing to give us all the information he possessed, but at that time was very much engaged. Shall call and see him again.

Tuesday 19th went to see mill belonging to Ekersly & Sons in which they have 30,000 spindles. Established at cost of $250,000. Machinery set very close. Mill very steady and solid.

Then follows a long schedule of wages, expenses and description of textile machinery.

March 20th went with Mr. Winstanley to Preston. Saw locomotives with four wheels, boilers with 92 tubes 3′ 4″ long similar to Bury's.

Monday 25th called at shop of S. & R. Roberts. They have two very large shops and employ about 800 men, paying six shillings per day average. They are turning out about one engine per week.

Wed. 27th went to see Liverpool & Manchester R. R. Shops. They have about 60 engines nearly all of six wheel type some of which are outside coupled and are used for carrying heavy freight trains.

Thursday 28th went to see Mr. Bury's shops where he builds four wheel engines some of them coupled outside. Does pretty good work. Bought some mathematical instruments for Mr. Whistler and myself.

Saturday 30th went to Messrs. Fairburn & Co. and Joseph Whitworths. Bought at last place two machine tools.

Tuesday April 2, went to shop of R. Stephenson & Co. Mr. S. not at home. Went over their works which are very extensive.

They are making some very large engines which weigh with tender 30 tons. They have good tools and finish their work very well. I "bot" of them one metallic hose, two water gages and three doz. glass tubes, paid a high price for them I think.

I got their price for crank axles which was £9 for every 112 lbs., finished. Rough forged only £5 which is rather too much.

Went to works of Lash, Wilson & Bell, large manufacturers of iron and chemicals employing about 900 help.

Bought four sets wrot iron wheels for engines and cars and got a plan of their wheels of which they make 10 feet diameter.

Monday April 22nd in London went to Great Western R. R. shops. Examined their engines and cars. Engines very heavy weighing 16 to 18 tons when filled with water. Have 6 wheels, with very large crank axles about 6″ diameter and all kinds of engine wheels. Some have wrought spokes fitted into cast iron hubs with a file and top end broad riveted to tire. Some had forged rims and spokes and hub cast on, a hoop tire going over the rim completes the wheel.

Wednesday 24th went to see Thames Tunnel and was much pleased with the work. Was introduced to Mr. Brunel and found he began engineering in the United States.

Monday 29th went with Burnham to railroads to see families emigrating to America. They were full of apprehension and fears that they would be made slaves of. I said to them that they were going to a fine place and would be well used and when told that I was an American were much astonished hardly believing me.

Had some talk with a Mr. Fife (Scotchman) about engine repairs. He faces steam chests with steel, the slide valves being chilled cast iron which he says is very good.

Friday visited Mr. Ibbotson's works and saw them make cast steel which is melted in pots and cast in iron moulds. It is then heated and drawn or rolled into sheets. Gave him an order for steel and for some iron wire, and got prices on files and other articles made by them.

Tuesday May 7th went to see Mr. Ingleby and ordered some brass pipe for locomotives and on the 8th Mr. Ingleby and myself were allowed to see a very fine cotton factory where they use only Sea Island Cotton. "Bot" of David Gordon a steam whistle for £1. 10s.

Saturday May 18th settled affairs in England and taking passenger steamer Great Western took return course for America arriving in New York 2 A. M. Friday May 31.

There is a great deal of description of textile mills and machinery, and of social affairs and entertainment, much of which is certainly interesting, but the matter pertaining to

locomotive building is rather meager and one receives the impression that perhaps Mr. Brownell was not admitted to the inmost thoughts, designs and practices of English builders.

This would not be at all strange for the proprietors there and in America were jealous of their processes and anxious to keep them secret if possible.

The history of Lowell records Mr. Brownell as a man who by integrity and singleness of purpose won a prominent position as a citizen and acquired a competency for his family. He died in Lowell April 27, 1872.

Nathan Appleton.

In the pursuit of our subject we will seek acquaintance with the work of many men well remembered for their connection with Lowell's great industries and we would not intentionally fail to give one and all due credit, while it may not be possible to relate many interesting facts about all.

The name of Appleton is so closely associated with the whole development as to be of interest.

Nathan Appleton at the earnest request of Mr. Crowninshield, treasurer of the Merrimack Mfg. Co., Mr. Cary, president of the Locks and Canals Co. and Mr. Francis, their agent, wrote an interesting account of the introduction of the power loom, published in 1858 by B. H. Penhallow of Lowell.

In answering the letter of request, Mr. Appleton in a charmingly modest manner, after admitting a frequent thought of his own purpose to write such a review, declares that the greatest obstacle to his doing so was the continual use of the personal pronoun which would appear more properly in a posthumous autobiography, and goes on to say that their urgency and also the fact as he put it of approaching garrulous old age might pardonably allow him some license to talk of himself. At this time he was the sole survivor of the three men so closely associated in the beginning of Lowell.

He mentions meeting Mr. Lowell in Edinburgh in 1811 and conversed many times with him on the subject of cotton manufacture, and both agreed to familiarize themselves with the industry as obtaining in England before returning to America. The descriptions in the pamphlet, of the early textile machines are intensely interesting.

The keen mentality possessed by these men is evident in a conversation with a Mr. Shepherd of Taunton who held a patent for a winding machine which was considered then to be the best extant. Mr. Lowell was offering some reduced terms for a right to use them on a large scale, which Mr. Shepherd refused, declaring that they faced the necessity of paying him his price and that they could not do without them, whereupon Mr. Moody suggested that he was thinking of spinning the cops upon the bobbin. "You be hanged", replied Mr. Shepherd, and then told them he would accept their offer. Mr. Lowell, probably awake to Mr. Moody's thought, told him that it was then too late.

In this paper Mr. Appleton mentions the Pawtucket Canal as belonging to a company incorporated in 1792 as the proprietors of the Locks and Canals on the Merrimack River, apparently established originally with a view of making the Merrimack River navigable to Newburyport, and that rafts of wood and lumber were passing through at times.

The new company decided in 1822 upon an enlargement of the canal that would make it sixty feet wide and eight feet deep.

The works reached a degree of completion permitting the starting of the wheel at the Merrimack Co. on September 1, 1823.

Another interesting account in Mr. Appelton's review tells of the early water wheels. The first were made upon the principle recommended by Smeaton, the hydraulic engineer, but these yielded only seventy-five per cent efficiency, and were superseded by the turbine a French invention, greatly improved by Uriah A. Boyden, another name closely associated with the Locks and Canals Co., and whose labors and skill were exercised in the plant where the locomotives were also built.

Mr. William E. Worthen, bearing a name familiar to Lowell's devoted scions, and himself a noted engineer, wrote delightfully of Mr. Francis, recalling first meeting him at Lowell in 1834, soon after he came here from Stonington, Conn., with Mr. Whistler. Mr. Worthen mentions the attraction offered to engineers by the extended undertakings in railroad construction in this country which appealed to Mr. Francis, leading him to take his chances in America.

We are in thought led along the branch canals leading from the storehouses of the mills to the Pawtucket canal, thence to the Middlesex canal, noting as we go the delivery of freight by

boat. Incidentally we read of the great demand for wood fuel, and the sharp competition occasioned with the Middlesex glass works.

A further perusal of Mr. Worthen's paper brings us after this rambling but pleasant detour back to our subject route.

We have often wondered how the shops were equipped to handle and machine the ponderous parts of the locomotives.

Mr. Worthen describes to some extent the appliances used, considering the lathes and drills very good, but stresses the importance of the cold chisel and file at that period. He mentions the advent of the first planer, which we imagine would seem crude to us.

There were none of the wonderful modern machine tools, and another serious difficulty was the radical difference in construction of cotton machinery and locomotives.

Mr. Whistler is stated, by Mr. Worthen, to have had as a West Point graduate the best education of the time, but with little practical knowledge of machinery. He was an admirable draughtsman of great executive ability and of as much experience with railroad work as anyone had undergone.

With Mr. Francis' assistance they proceeded to design and construct their first locomotive. Only a mechanic can partake of their vision or appreciate their anxiety. How simple and crude they would seem today.

It was in Mr. Worthen's paper that the writer found anything tangible about the three engines built for the Western Railroad of Massachusetts. These were named Massachusetts, New York and Rhode Island, and were described as outside connected coupled four-wheel engines. Another of the same type was built for the Boston and Providence (See later comments).

We read further that Mr. Whistler became so much attached to Mr. Francis that he desired his companionship in Russia, but further reading, disclosing the event of Mr. Francis' marriage with Miss Sarah Brownell, perhaps explains to some extent his decision to remain in Lowell.

Walter McQueen.

Considerable influence in locomotive design exerted by Walter McQueen is evident in the company's production during the

early fifties. This gentleman, of Scotch birth had been building locomotives as early as 1840, when he turned out from his shop in Albany, N. Y., a small Norris type engine called "Old Puff" for the Ithaca and Owego Railroad.

McQueen designed many locomotives for the Hudson River Railroad, and sixteen were built at the Lowell Machine Shop. Fourteen of the engines were equipped with the Croton cut off, which Mr. McQueen is thought to have invented, and which is described in detail elsewhere.

McQueen afterwards became the manager of the locomotive works at Schenectady, and his development of the eight-wheel American type acquired high reputation, placing this concern in a position that lead to its high rank today in leading industries.

Zerah Colburn.

A very noteworthy personage, closely associated with the Lowell Machine Shops, was Zerah Colburn, who was born on a farm near Saratoga Springs, 1832. Early deprived of a father, he was taken by his mother to a little farm in New Hampshire, growing up among the surroundings of the hills and streams that have given so many strong characters to the country's prosperity.

His education was slight, but his ambition led him to seek fields abroad, and he became apprentice at fifteen years of age to the Lowell Machine Shops.

While there is little record of his first work in that establishment it is certain that within a few years he became one of the most expert draughtsman in the United States.

It may not be unfair to credit him as the very leading member of that craft.

What is actually preserved of Mr. Colburn's work shows his remarkable skill. Close inspection reveals a very wonderful quality of line and line values and exactness of delineation.

Later Mr. Colburn joined the mechanical department of the Concord Railroad, after which he was superintendent at Southers' locomotive shops in Boston.

The Colburn who became famous as a mathematician was Zerah's uncle. They are sometimes credited with each others' work.

Colburn became also quite famous at the time for the literary ability manifested in many technical articles published in the mechanical papers of the period. We read favorable criticisms expressing praise for elegant diction and lucid description to such an extent that his articles and books undoubtedly enhanced the popularity of mechanical literature. He published Colburn's Railway Advocate, became editor of the Engineer of London, a highly technical paper, and left to posterity his book on Locomotive Engineering and the Mechanism of Railways, now very rare and of much value.

His life was an inspiration for the growing youth, and if all artisans could be guided by such ideals, our trade concerns today would be on a level practically foreign to the present labor troubles.

We would not linger so long in the review of a character were he not so closely connected with the subject of our paper. To experts it would remain of interest to mention his development of the wide firebox boiler and it may surprise some to know that this now very popular and necessary adjunct of our enormous locomotives dates back to the experiments and practice of Colburn and Winan in the early fifties.

Wilson Eddy.

Another prominent locomotive builder whose apprenticeship was served in the Locks and Canals Shops was Wilson Eddy, afterwards master mechanic of the Boston and Albany R. R., which absorbed the Western R. R. of Massachusetts. He is said to have worked in the Locks and Canals Shops at the first iron planing machine in this country.

Mr. Eddy was employed by Major Whistler, who was in charge of the Western Railroad and he became foreman of the Springfield shops.

At that time the road was using several engines built by the Lowell shops of their customary English type, and Mr. Eddy set about designing more powerful machines to cope with the Berkshire hills.

His first engine, finished early in 1851, named the Addison Gilmore, attained considerable fame as the winner of the locomotive race for passenger engines at Washington, held under

the auspices of the Lowell Railroad and Middlesex Mechanics Association.

Mr. Eddy's early work exhibited Locks and Canals influence in the single pair of driving wheels and certain details, but he deviated fortunately in other respects which tended to perpetuate his work, but the failure to accept such deviations by the Lowell and some other builders certainly shortened their days as builders.

Mr. Eddy, in his designs, greatly increased the grate area and heating surface in proportion to cylinder volumes which was immediately justified by competition with other machines.

The locomotives which Mr. Eddy built were so efficient, dependable and economical that they were called Eddy clocks. He built at the Springfield shops many passenger and freight engines for the Boston and Albany, some of which were in regular service in the 1890's.

Mr. A. B. Underhill.

It was during the latter part of the locomotive construction period at the Lowell Machine Shop that Mr. Arthur B. Underhill was connected with the concern.

When Mr. Eddy retired in 1880 as Master Mechanic of the Boston & Albany shops, at Springfield, Mr. Underhill became Superintendent of Motive Power with headquarters at Springfield, and the improved Underhill type of engine, standard for several years on the Boston & Albany gave results that proved very creditable to him.

Oliver Cushing.

Collectors of locomotive drawings and lithographs set high value upon those drawn by Oliver E. Cushing and lithographed by Bradford.

Mr. Cushing once a familiar figure upon the streets of Lowell and a very worthy citizen was draughtsman in the Lowell Machine Shops in the early fifties, and the possessors of the colored lithographs issued at that period will find Mr. Cushing's name right under the rail in the left hand lower corner.

Whether Mr. Cushing colored his locomotive drawings himself or left that to the lithographers, the ink drawings reflect great credit upon him. We suspect that the coloring was

his work, for all locomotive builders had their own ideas about the decoration of their engines.

The Locomotive Production.

If the first engines built by the Locks and Canals Co. were copied from the Stephenson engine which was received by the Boston and Lowell Railroad in 1834, they probably weighed about seven tons, had 11x16 cylinders, were of about 30 horse power, and as previously described had four wheels with the power of the inside cylinders applied to the cranked axle of the rear pair of wheels. They had no cabs, but a railing of brass and iron partially protected the engine crew. The smokestacks were very tall of the same diameter, about 10", from base to tip. A small bell was located not far from the driver. A steam dome which may have been located over the crown sheet or possibly quite well forward on the boiler probably had at first, undoubtedly later, a whistle with a cord extending from its valve lever to the driver's position. There was a safety valve of the spring type, with a long trumpet mouthed escape pipe located at about the centre of the tube length of the boiler. This safety valve may have been of the encased spring type or a spring loaded lever with the spring at some distance from the fulcrum, not unlike the lever of a steel yard scale.

As any reliable form of a steam gauge was at least not in use at this time, it is doubtful if one was applied. In fact it was several years later than this before dependable pressure gauges were available. The first gauges were modifications of the spring loaded lever safety valve, in which the indicating scale was a slot in the side of an encasing tube and the valve being given a vertical play before releasing the index which moved up and down with the top of the valve traced its course past the marks for pounds on the vertical slot. This arrangement was however seriously affected by the gradual weakening of the spring, thereby falsely indicating the actual pressure obtained.

There is an authentic anecdote of one of the early engine drivers upon the Boston and Albany who was operating an English built locomotive of the same type in the fifties, and who was getting very indifferent results with it although supposed to be carrying 80 lbs. pressure. Having his attention

called to a new type of gauge very like a small clock in shape, which a pioneering salesman was trying with difficulty to introduce, he bought one and personally attached it to his engine, whereupon it indicated only 45 lbs. pressure when the old gauge showed 80 lbs. and the safety valve blew. He immediately screwed down the safety valve and abandoned the old gauge. The remarkable improvement in the engine's performance attracted attention from the motive power chief and he ordered full equipment for the road's engines. This marked the introducing of the Bourdon spring in New England. It is the standard pressure gauge for steam, gas and air today.

To return to the first of the L. & C. engines, another feature characteristic of the times was the engine frame and journals which were located outside of the wheels with pedestals carrying journal boxes having a vertical vibration upon which the weight of the boiler was supported by intervening springs. There were no compensating levers in those days to absorb the track inequalities, and that practice is not in effect generally in England or on the continent today. The English road bed and track alignment has always been so accurately maintained that there is largely freedom from vertical disturbances while rolling over it.

But upon the quickly and cheaply built American roads of sand and gravel ballast and light rails weakly connected at the joints the vertical shocks were undoubtedly severe, and very early it was determined that to prevent derailment something must be arranged. Without going into tedious detail the equalizer invented by Joseph Harrison in 1836, which consists of a lever between adjacent journals rocking upon a pin, upon which the superstructure rests allows considerable vertical play of the journals up and down over jounces without disturbing the relative weights upon the journals. This is standard American practice today. While invented and applied to a locomotive in 1836 it took some time for the railroads to be convinced of its necessity and many early engines were built with only the independently vibrating journal boxes.

One feature of these inside connected locomotives which must have taxed the forge and machine shop to its very limit was the cranked axle. Formed of massive iron, later steel, with the two cranks at 90 degree intervals, and necessarily large to

meet the great opposing strains transmitted through a tortuous direction its fabrication almost surpasses our belief and certainly arouses our admiration.

Some of the early builders adopted under Baldwin's inspiration a curious type called the semi-cranked axle in which the driving rods operated upon a crank pin one end of which entered a crank on the axle and the other was forced into the driving wheel itself. This was much more easily built and maintained, but became superseded by the outside connected type.

From such available data as we possess, lamentably meager at that, it is evident that the Patrick, Boston, Lowell and Merrimack, built in 1835 were of the type described.

The first three had brass driving wheels, possibly all four wheels were brass. The Merrimack had wooden wheels with iron tires shrunk on. Baldwin used a combination of wood and iron wheels on his first engine, "Old Ironsides", but they were very unsatisfactory and his second engine, the " E. L. Miller", built for the Charleston and Hamburg R. R. of South Carolina had brass wheels. It was thought, you are asked to observe, that the brass tires comparatively soft would adhere better to the rail. At this time most of the locomotive builders were adverse to coupled drivers and their single driver engines were failing from insufficient adhesion. But the brass drivers rapidly wore out and experience has demonstrated in spite of foolish lapses from reason that the hardest steel compatible with tensile strength is the proper material for tires.

The only wrought tires for locomotives made in this country previous to 1840, were forged by S. Vail and Son of Morristown, N. J. and very likely the Locks and Canals bought some of them, although some were later imported from England.

These first engines had small four wheel tenders carrying a tank for water and with a space for fuel. They had vibrating journal boxes and spring suspension.

The following is a list of some of the early engines built by the Locks & Canals Co.:

"Lowell", Boston & Providence R. R., 1835.
"Providence", Boston & Providence R. R. 1835.
"Lowell", Boston & Worcester R. R., 1836.

"Patrick", Boston & Lowell R. R., 1835.
"Lowell", Boston & Lowell R. R. 1835.
"Boston", Boston & Lowell R. R., 1835.
"Merrimac", Boston & Lowell R. R., 1836.
"Concord", Boston & Lowell R. R., 1836.
"Nashua", Boston & Lowell R. R., 1836.
"Suffolk", Eastern R. R., 1838.
"Essex", Eastern R. R., 1838.
"Merrimack", Eastern R. R., 1838.
"Rockingham", Eastern R. R., 1838.
"Andover", Andover & Haverhill R. R., 1836.
"Haverhill", Andover & Haverhill R. R., 1836.
"Rockingham", Andover & Haverhill R. R., 1837.
"Taunton", Taunton Branch R. R., 1836.
"New Bedford", Taunton Branch R. R., 1837.
"Stonington", N. Y. Prov. & Boston R. R., 1836.
"Rhode Island", N. Y. Prov. & Boston R. R., 1836.
"Apponaug", N. Y. Prov. & Boston R. R., 1836.
"Greenwich", N. Y. Prov. & Boston R. R., 1836.
"Little Rest", N. Y. Prov. & Boston R. R., 1836.
"Pawcatuck", N. Y. Prov. & Boston R. R., 1836.
"Hicksville", Long Island R. R., 1836.
"Buffalo", Buffalo & Niagara Falls R. R., 1835.
"Whistler", Paterson & Hudson R. R., 1835.
"Susquehanna", Phila. Wilm. & Balt. R. R., 1836.
"Maryland", Baltimore & Susquehanna R. R., 1837.
"Baltimore", Baltimore & Susquehanna R. R., 1837.
"Susquehanna", Baltimore & Susquehanna R. R. 1837.
"Howard", Baltimore & Susquehanna R. R., 1837.

In 1836 the engines "Nashua" and "Concord" were built for the Boston and Lowell. They are scheduled on the list of early B. & L. engines as similar to the previous four in dimensions and were probably so in appearance.

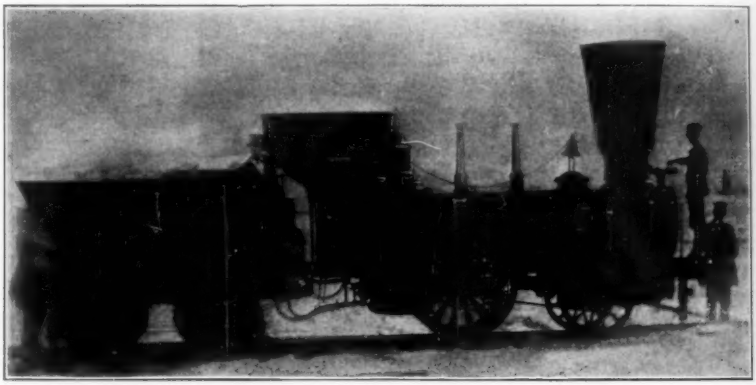
These engines survived until the early sixties, the "Concord" which was the longest lived being scrapped by the B. L. & N. in 1872.

In 1840 the "Medford" was built and in 1842 the "Sampson", "Goliath" and "Hercules" astounded the patrons of the road with their hugeness. As they had 12½x16" cylinders some

increase in weight and apparent size must have been obvious. Of these the "Hercules" was sold in 1855. The "Goliath" disappeared in 1870, and the "Sampson" rounded out a grand old life in 1873.

To retrace our steps somewhat, the records show that in 1835 and 36 the Company built three engines for the Western Railroad of Massachusetts. Now these are described as four wheel coupled outside connected engines, and that another of the same type was built for the Boston and Providence named the "King Philip".

Further details of these engines with sufficient basis for conceiving their extraneous appearances are not in my possession. As this was an early date for this type, either the Locks and Canals Company was indeed pioneering, or there is some question of the accuracy of the description.



Western R. R. of Mass. 'Bristol."

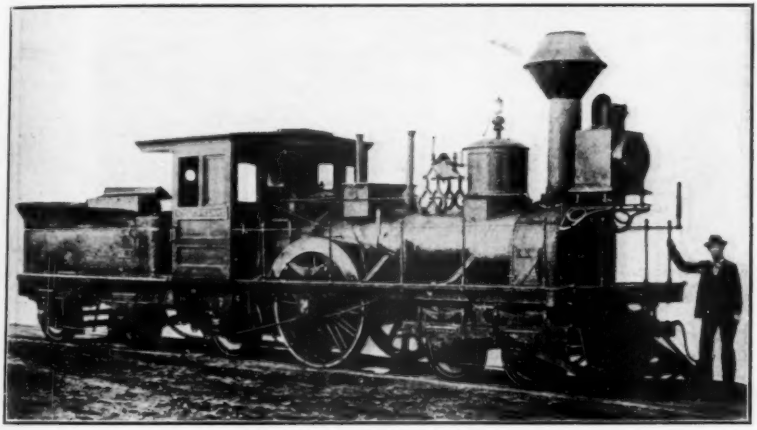
A photograph of the engine "Bristol" built also for the Western R. R., which was kindly handed me by Mr. J. W. Merrill shows that the Planet type was certainly being adhered to by the builders.

The introduction of the outside connected engine was somewhat retarded by the fact that in the road service of the inside cylinder machines they demonstrated greater steadiness of running, and drivers dared to make higher speed with them. The claim for steadier running is well substantiated to the writers

knowledge and experience and while careful rotating counter balancing or reciprocating weights has greatly improved the riding qualities of the modern outside cylinder locomotives, they will probably never equal the steady even gait of the old narrow chested Shanghais that were popular on the road even into the eighties.

In 1836 the Locks and Canals Company built the engine "Lowell" for the Boston and Worcester, of which no record is available.

Two engines, the "Rockingham" and "Thomas James" were acquired by the Marietta & Cincinnati R. R. and it is thought that they were built in 1837 possibly for a New England R. R. and later sold west.



New York, Providence & Boston R. R., "Roger Williams."

In 1837 the engine "Roger Williams" was built for the Providence and Stonington Railroad. The appearance of this engine as it was rebuilt in 1846 is preserved in a photograph in our possession. Originally it was of the same type as the other inside connected single driver engines previously built, but with the modification of a leading four wheel pivoted truck. This leads to the query as to when this modification became practiced in Lowell. Such a leading truck came into use as early as 1834 was ascribed to the ingenuity of William Norris a successful early builder.

Mr. Anderson, master mechanic of the Providence & Stonington, rebuilt the "Roger Williams" in 1846 and among other improvements lengthened the boiler and added a pair of trailing trucks back of the firebox. The alterations probably improved the riding and steaming qualities of the engine and lowered its tractive efficiency. Another engine named the "Apponaug" was built at this time for the Providence & Stonington of similar appearance to the "Roger Williams".

In 1839 the engine "Roebuck" was built for the Nashua & Lowell R. R. This was a 4-2-0 engine, or to explain had a four wheel leading truck and a pair of drivers, one on each side and inside connected. The cylinders were 11x18", the engine cost the railroad $6500.00, this engine was scrapped in 1856.

In 1839 the Locks and Canals Company built for the Boston and Maine R. R. the engines "Meteor" and "Berwick" and in 1844 the "Whistler" and "Medford" all of which were six wheel machines very likely similar to the "Roebuck"; they were in use until 1860.

According to a United States Government Steam Boiler report, issued in 1838, the Locks and Canals Company had at that time built thirty-five engines. Of many of these there remains no record whatever.

From 1838 to 1845 when the Company became reorganized as the Lowell Machine Shops, the company built nine more, all of which are previously mentioned, making forty-seven in all to be credited to the original company.

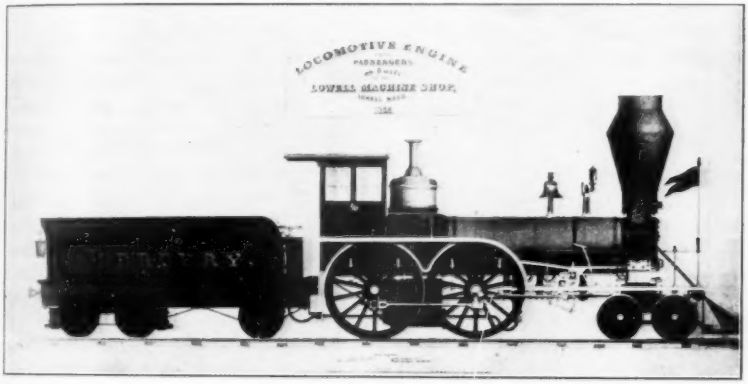
The work of building locomotives was continued by the New Company, and apparently commenced with an infusion of new ideas and practices, for among its products were the "Whistler", "Baldwin" and "Milford" built in 1847 of much larger size and more powerful. These were eight wheel four coupled engines with 11x14" cylinders, one the "Whistler" with 66" drivers and the others with 69" drivers.

In 1848 the Pawtucket was built for the Boston & Lowell, of the same dimensions as the "Whistler". This latter engine lasted until 1879 and was at that time scrapped by the Boston and Lowell.

The writer has copied the shop list of engines beginning with the year 1851. At that time the first engine in the list, the "Croton", built for the Hudson River Railroad carried the shop

number 91. If the engines turned out had consecutive shop numbers this would indicate a considerable gap in the records and would also indicate an astonishing increase in production. There is very likely some reasonable explanation for the discrepancy.

In 1851 the shops turned six locomotives for the Hudson River R. R., namely the "Croton", "SpuytenDuyvil", "West Point", "Albany", "Kinderhook", and "Matteawan". These were eight wheel, four coupled inside cylinder engines with 12″x20″ cylinders, 68″ drivers and sixteen tons weight. These in common with others built for that railroad were designed by Walter McQueen and had the Croton cut-off.



Locomotive 'Mercury.'

In 1852 were built for the Syracuse and Utica R. R. the "Apollo" and "Mercury" of similar type, but heavier, weighing 39,500 pounds.

In 1852 the shops built for the Hudson River eight engines, namely "Rensallaer", "Columbia", "Hudson", "Lowell", "Sing Sing", "Peekskill", "Rochester", and "Buffalo", all of which were of the eight wheel four coupled outside cylinder type and built for speed. They had 16½x22″ cylinders, 72″ drivers and weighed 55,275 pounds, or nearly twenty-eight tons, showing a marked development by that time. Beautiful lithographs reproducing the splendid drawings of Mr. Oliver Cushing are preserved, that show the details and bright colors that characterized them.

In 1852 two engines, the "Mars" and "Bellona", 14x20" inside connected with 66" drivers were also built for the Syracuse & Utica.

In 1852 and '53 they built ten engines for the Great Western of Canada. They were the "Canada", "Niagara", "London", "Hamilton", 16x22 inside cylinders, 72" drivers with Croton cut-off. The "Essex", "Kent", "Elgin", "Norfolk", "Brant", "Wentworth", 14x22 inside connected, 66" drivers and Croton cut-off.

For the Chicago & Galena Railroad, in 1852, the "Cloud" and "Ariel" were constructed of twenty tons weight 12½x20" inside cylinders, 66" drivers.

For the Mad River and Lake Erie Railroad in 1853 were built the "St. Lawrence", "Mississippi", "Hudson" and "Niagara" all inside connected, 14x20" cylinders, 66" drivers and Croton cut-off.

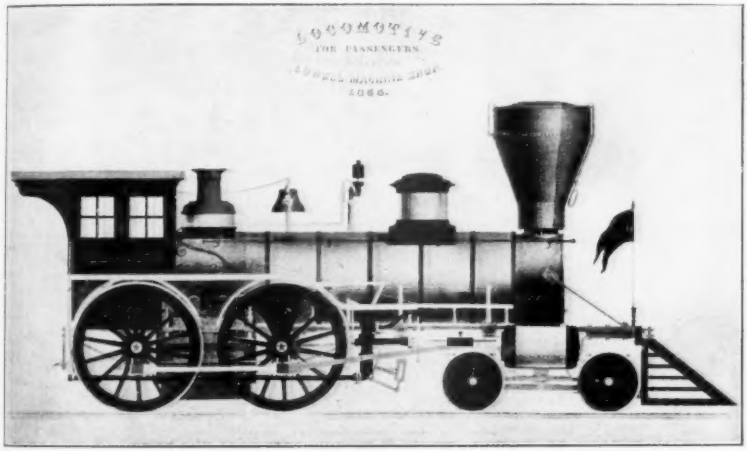
For the Rutland & Burlington in 1853 were built the "Cleveland" 16x22" cylinders, Croton valve gear, 66" drivers, and the "California", "Texas" and "Oregon" with 16x22" outside cylinders and 54" drivers. These engines were not delivered, for some reason, to the Rutland and Burlington, but were sold to the Boston and Albany.

Now there came to the Lowell shops the same predicament that was disturbing all the other builders both in America and England.

From the days of the early Planet engines to the late forties the drop hook valve gear had been the popular type in the shops, if not on the road. This was essentially a very clumsy arrangement to meet a very necessary control of the engine's movement. Selective direction of movement perfectly controlled by the driver was one of the elementary requirements in a locomotive. At first and for some time the forward and backward control was deemed sufficient, but as the use of steam expansively became more and more evident as a desirable economy and also of assistance to overworked boilers, various crude and curious appliances were introduced to accomplish the purpose.

The motion of the valves was derived then, and quite generally until recent times, from eccentrics located upon the driving axle between the frames. An eccentric is in effect a

circular crank or cam the arm of which is greater in diameter than the axle, and the axle passes through it, not in the centre but at one side, so that the arm vibrates while rotating in a direction at right angles to the axle. This is convertible into a reciprocating movement of the valve, and if the engine were always to run in one direction, one eccentric for each cylinder valve would suffice. But when a forward and reverse movement of the engine was demanded, it became necessary to make the crank effect of the eccentric reversible. At first the single eccentric was retained, the reversing being accomplished by transferring the eccentric rod end to another pin on the opposite end of a rocker arm to which the valve stem was connected. On the end of the eccentric rod was an inverted V. shaped hook. When



Locomotive "Leader."

the engine driver wanted to reverse, he would by means of a lever on the running board lift the hook off the go-ahead pin and when the other pin came along drop the hook onto it.

This was accomplished with much jerking of machinery. The device did reverse the engine, but when it was discovered that a very subtle phenomenon called admission lead became desirable the locomotive builder had to apply two eccentrics for each cylinder, one for going ahead set slightly advance of the engine stroke and one for going astern similarly adjusted. This

necessitated four drop hooks for the driver to monkey with and as the accompanying levers on the running board went back and forth all the time when the engine was in motion, he was well occupied with keeping out of their way to say nothing of running the train.

Whence the cause of great experimentation with valve gears. There are none so blind as those that wont see. The very devices that today accomplish these purposes so creditably were invented in the early thirties. That they were not promptly adopted is largely due to difficulties of manufacture and delicacy of adjustment.

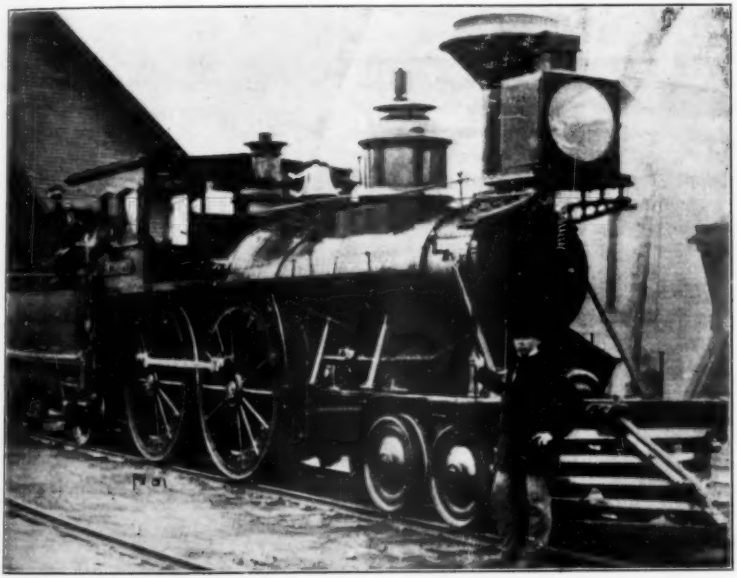
But if the builders were skeptical as to the Stephenson link or the Walschaert gear, they certainly outdid themselves in producing marvelously complex devices that never secured lasting results and the patent office and shop drafting rooms are full of different expansion valve gear designs of the period.

The Croton gear was one of these. Designed by McQueen, for a few years it was his pet, and standard on Hudson River engines. Each valve chest had two valves, the lower being the main ahead and astern valve, traveling on a constant port opening and unvariable in admission, which was about ⅔ piston stroke. On top of this valve, on a separate table, was another valve driven by a crank on the main crank pin and outside of the main connecting rod. This was necessarily arranged to operate in forward gear only although some other designers had succeeded in attaining a similar device that operated in reverse with a negative lead. This riding valve gave an admission period of arbitrary extent as far as the design went, but actually a fixed period in practice, usually of ½ piston stroke. Practically all the builders of the times went into such a practice as this, but a fine mechanical mind and one capable of appreciating real merit in other peoples' devices lead Thomas Rogers, who by 1842 was building successful outside connected engines of more advanced construction than his competitors, to adopt the Stephenson link, so called, as his standard valve gear. He had already exhausted the possibilities of the drop hook gear, and understanding more or less about those subtle and at that time little analyzed phenomena obtained by the link motion, he began to experiment with the latter, at first using a link that was suspended at a fixed position with a moving block on the radial

valve rod, but finally in 1849 he produced the fine locomotive "Victory" which had the usual raising and lowering link on a block pivoted on the lower end of a rocker, the upper end being connected to the valve rod.

Rogers' favorite and much used form of this gear had a shifting rod suspended below the engine frame while the standard practice later became the overhung type which was lighter and more simple.

Baldwin always in the lead for production and general



Boston & Providence R. R. "Sharon."

publicity had obstinately refused to adopt the link motion, until some of his customers threatened to go elsewhere, whereupon he took it up and developed a beautiful specimen of it, which quite won him over to its real merit.

The Stephenson link was invented by William T. James of this country in 1832 and applied to a small locomotive built for the Baltimore and Ohio R. R., which met with a boiler explosion that so generally dashed the hopes of the inventor that for a time it was practically forgotten.

Ten years later William Williams, an employee of Robert Stephenson and Company of Newcastle, England, brought out a similar device applied to a North Midland Railway engine.

It rapidly gained popularity in Great Britian but American builders would have none of it until Rogers became a warm advocate.

So perfect is its peculiar operation that the valve control from full to mid gear with all its effect upon the steam expansion is easily and comfortably at the drivers option.

While its application has continually lead to warm discussions and arbitrary attitudes regarding the minor peculiarities of changing lead as mid gear approaches and the wear of the block in the link and again the relative merits of built up and solid links, it still remains one of the two great leading valve gears.

Anyone can see it very clearly on one of our steam road rollers, while the driver proceeded first in one direction and then in the other.

The Lowell shops were bound to have this valve gear desired in its production, and in 1852 the Hudson River Road ordered two locomotives, the "Fishkill" and "Rhinebeck", with 16x22" outside cylinders, Stephenson link gear and 66" drivers.

The Western Vermont in 1854 had the "Falcon" built here with 14x20" inside cylinders, 66" drivers, twentytwo tons weight.

The shops built the same year the engines "Ariel" and "Cloud" of the same 14x20" inside, twentytwo tons, 66" driver type, and the Ariel was sold to the Boston & Providence, becoming the Sharon on that road. The "Cloud" went to the Boston & Lowell.

In 1854 they built for the Michigan Central four engines, "Grey Hound", "Fox Hound", "Stag Hound" and "Wolf Hound", which were 16x22 inside, link gear, 72" drivers, speed wagons.

In 1854 two were delivered to the Penobscot & Kennebec of Maine, 14x20 inside connected, 60" drivers, named respectively "Katahdin" and "Kenduskeag".

We are now to mention the last engines built at the shops, the actual dates of construction not being recorded, only the dates of sale. These were declining days in the locomotive building at Lowell.

An engine of no recorded name was sold in 1859 to the Boston and Providence Railroad. It is thought to have been named "Foxboro" by that road. It was a 14x20″ insider with link gear and 66″ drivers.

Another engine called the "Austin" was delivered in 1859 to the Buffalo, Byron, Brazos and Colorado Railroad. It was a 12x20″ outside connected, link gear, 54″ drivers, sixteen tons weight.

There now remains but three engines to describe that were built to conform to a specification for Class B of 1855.

Class A of 1855, of which probably only one engine sold to the Boston and Providence Railroad, conformed to the following details. Inside cylinders 14x20″. Crank axle 6½″ diameter in the bearings. Four drivers 5′ 6″ diameter. Four wheel leading truck with Converse and Washburn wheels. Full stroke pumps of cross head drive. Stephenson link valve motion. Firebox 3′-8¾″ long, 1′-2½″ wide, 4′-11″ high inside, ¾″ copper tube sheet. 121 10′-4″x2″ copper tubes. 42″ diameter boiler with inside firebox plates of Lowmoor iron, other boiler plates Pennsylvania iron. Frame wrought iron with welded jaws. Weight in running order 44,000 pounds. Tender to hold sixteen hundred gallons of water, with two four wheel 30″ diameter trucks built with wooden frame.

Class B of the same year required outside cylinders 15x22″, with 6½″ main journals, 5′-6″ drivers, four wheel truck with 30″ Converse and Washburn wheels. Full stroke pumps. Stephenson link gear. Firebox 3′-8¾″x3′ - 2½″x5′ - 1¾″. ¾″ firebox tube sheet, 140 11′-2″ copper tubes. 44″ boiler. Lowmoor iron inside firebox plates. Pennsylvania outside plates. Wrought iron frame with welded jaws. Running weight 48,000 pounds. Eighteen hundred gallon tank. Two four wheel trucks with wooden frames and 30″ wheels.

There were only three built, as stated to conform to this specification, one the "Champion" sold in 1859. One the "Franklin Haven" sold in 1860 and the "William Sturgis" sold to the Boston and Lowell in 1858.

The Company issued in 1855 a colored lithograph to illustrate Class B engine. This lithograph clearly represents some of the critical discrepancies which caused Class B specification to fail to attract purchasers.

Whether a falling off in interest in locomotive building or a lack of proper designers pervaded the company, at any rate the design was lamentably deficient as compared with the products of practically all competitors.

It is not invariably true that lack of progressiveness lead to declining orders for machines in every case, nor that extreme skill and advanced design assured perpetuity to a manufacturer.

A careful analysis of the causes leading to the long existence of certain locomotive producers would almost convince one that immediate and close business association with large trunk railroads and the fairly steady demand by them for rolling stock, as well as excellent business management, had a good deal to do with their longevity.

One of the very best builders of locomotives in this country, and a man who was remarkably in advance of his time, and whose production was considered the most excellently designed and built at one time in the United States, namely Wm. Mason of Taunton, did not secure perpetuity for his company. The Hinkley plant at Boston built a great many creditable engines but they are almost forgotten. The Blood Locomotive Works at Manchester, N. H., and the Rhode Island Locomotive Works at Providence were absorbed by the American Locomotive Company of Schenectady.

But when you realize that in the face of a bitter competition the builders who were turning out locomotives designed along much more scientific lines than the Class B engine, the local concern clung to unpopular details of frame, boiler, firebox and a very unscientific method of steam chest arrangement, you can perhaps understand that these engines represented their last efforts.

They were very deficient in grate area and heating surface. The frames were light and so made as to be very difficult to repair. Copper tubes and plates were expensive and unnecessary at a time when charcoal iron and steel were becoming popular.

The steam chests were of English pattern located inside the frames without rocker shafts and had direct valve and drive from the link. This would have been good practice on an inside cylinder engine, but for an outside it made far too much cooling passages between valves and cylinders.

They did not sell until four years or more after completion and of the three only the William Sturgis is of record since.

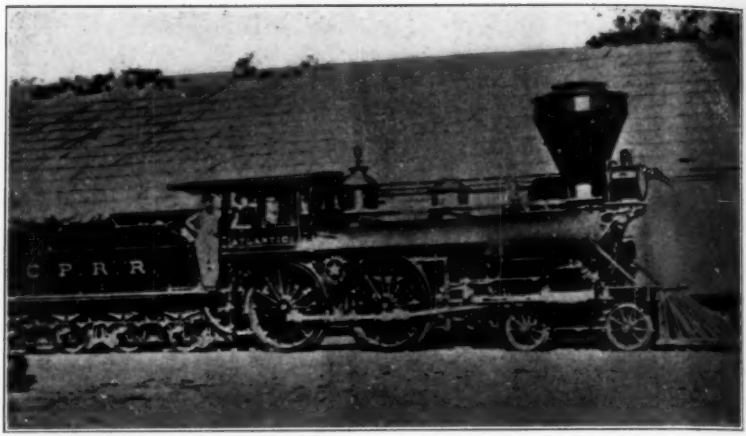
This engine blew up in the Lowell yard Feb. 18, 1868, was rebuilt by the Boston and Lowell and Nashua R. R. in 1869 and renamed the Medford. It was scrapped by the Boston and Maine in 1887. It was a poor steamer and unpopular with the men.

The government offered tempting sums for locomotives during the war of the rebellion and the great boom in railroad extensions and new construction following the war proved very profitable to all builders that were prepared to take advantage of it, but the Lowell concern had become entirely occupied in making textile machinery and the manufacture of locomotives ceased to be a local industry.

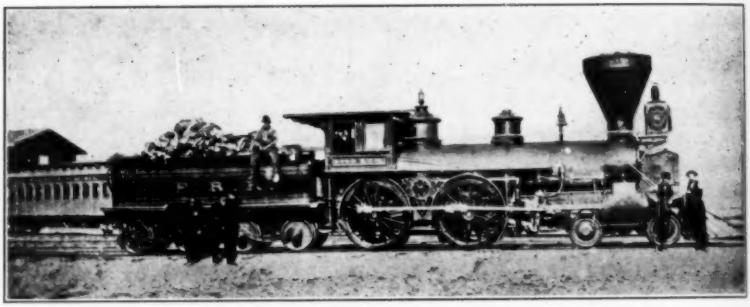
As the records show, some of their engines remained in service through the seventies and into the eighties, but are now only a faint memory, and in fact the product is no longer featured in New England.

The works at Portland, Maine, at one time so busy and profitable, but which ceased to produce by 1900, have recently taken up repair work.

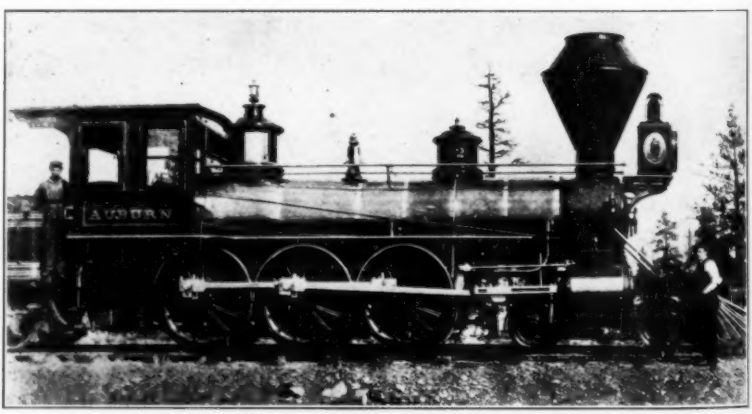
But the spindles are still turning by the Merrimack, and our grand old Machine Shop is about to see an immense enlargement which merits the best wishes of all.



C. P. "Atlantic"—Mason—1863.



C. P. "Gold Run"—McKay & Aldus—1867.



C. P. "Auburn"—McKay & Aldus—1866.

The Old Iron Horses of the Central Pacific.

No.	Name	Builder	Dia. of Drivers. Inches.	Cylinders. Inches.	Weight.	Date in Servic
1	Gov. Stanford, 4-4-0	R. Norris & Son	54	15x22	56000	Nov. 11, 1863
2	Pacific, 4-4-0	Wm. Mason	60	16x24	61000	Sept. 26, 1863
3	C. P. Huntington, 4-2-(	D. Cooke & Co.	54	11x15	39000	Apr. 1864
4	T. D. Judah, 4-2-2	D. Cooke & Co.	54	11x15	?	Apr. 1864
5	Atlantic, 4-4-0	Wm. Mason	60	15x22	58000	Nov. 27, 1863
6	Conness, 4-6-0	Wm. Mason	48	17x24	70500	Feb. 1864
7	Sargent, 4-4-0	Booth & Co.	60	16x24	56500	Feb. 1864
8	Nevada, 4-6-0	D. Cooke & Co.	48	18x22	70000	Feb. 1864
9	Utah, 4-6-0	D. Cooke & Co.	48	18x22	66800	Mar. 1864
10	Humboldt, 4-6-0	D. Cooke & Co.	48	18x22	66800	Mar. 1864
11	Artic, 4-6-0	Wm. Mason	60	15x22	58000	Feb. 20, 1864
12	Truckee, 4-6-0	Wm. Mason	48	17x24	70500	Nov. 27, 1865
13	Hercules, 4-6-0	D. Cooke & Co.	48	18x22	66800	Dec 1865
14	Oneonta, 4-6-0	D. Cooke & Co.	48	18x22	66800	Dec. 1865
15	Washoe, 4-6-0	D. Cooke & Co.	48	18x22	66800	Dec. 1865
16	Owyhee, 4-6-0	Wm. Mason	48	17x24	70500	Feb. 16, 1866
17	Idaho, 4-6-0	Wm. Mason	48	17x24	70500	Feb. 6, 1866
18	Piute, 4-6-0	D. Cooke & Co.	48	18x22	70000	1865 ?
19	Carson, 4-6-0	D. Cooke & Co.	48	18x22	70000	1865 ?
20	Amazon, 4-6-0	McKay & Aldus	54	18x24	73800	July 1866
21	Tamaroo, 4-6-0	McKay & Aldus	54	18x24	73800	Aug. 1866
22	Auburn, 4-6-0	McKay & Aldus	54	18x24	73800	Aug. 1866
23	Mona, 4-6-0	McKay & Aldus	54	18x24	72300	Aug. 1866
24	Montana, 4-6-0	McKay & Aldus	54	18x24	73800	Aug. 1866
25	Yuba, 4-6-0	McKay & Aldus	54	18x24	73800	Aug. 1866
26	Samson, 0-6-0	D. Cooke & Co.	45	17x22	70000	Feb. 1867
27	Goliah, 0-6-0	D. Cooke & Co.	45	17x22	73800	Feb. 1867
28	Gold Run, 4-4-0	McKay & Aldus	60	16x24	62100	? 1867
29	Antelope, 4-4-0	McKay & Aldus	60	16x24	62100	? 1867
30	Tahoe, 4-4-0	R. Norris & Son	60	16x22	60100	May 1867
31	Klamath, 4-4-0	R. Norris & Son	60	16x22	67800	May 1867
32	Ajax, 0-6-0	New Jersey Loco. Co.	48	16x24	65000	May 1867
33	Achilles, 0-6-0	New Jersey Loco. Co.	48	16x24	65000	May 1867
34	El Dorado, 4-4-0	R. Norris & Son	66	16x24	65250	June 1867
35	Boise, 4-4-0	R. Norris & Son	66	16x24	66250	June 1867
36	Shoshone, 4-4-0	R. Norris & Son	60	16x22	60100	June 1867
37	Mojave, 4-4-0	R. Norris & Son	60	16x22	60100	June 1867
38	Ogdenburg, 4-6-0	McKay & Aldus	54	18x24	73800	July 1867
39	Malone, 4-6-0	McKay & Aldus	54	18x24	73800	July 1867
40	Salano, 4-4-2	R. Norris & Son	54	14x24	58000	Sep. 1868
41	Stanislaus, 4-4-2	R. Norris & Son	54	14x24	58000	Sep. 1868
42	Tuolumne, 4-4-2	R. Norris & Son	60	14x24	58060	Sep. 1868
43	Tulare, 4-4-2	R. Norris & Son	60	14x24	52000	Sep. 1868
44	Colossus, 4-6-0	McKay & Aldus	54	18x24	72300	Aug. 1867
45	Majestic, 4-6-0	McKay & Aldus	54	18x24	72300	Aug. 1867
46	Unicorn, 4-6-0	McKay & Aldus	48	17x22	65000	Aug. 1867
47	Griffin, 4-6-0	McKay & Aldus	48	17x22	65000	Aug. 1867
48	Toiyahe, 4-6-0	Grant Loco. Co.	48	17x22	65000	Sep. 1867
49	Toquima, 4-6-0	Grant Loco. Co.	48	17x22	65000	Sep. 1867
50	Champion, 4-4-0	McKay & Aldus	60	16x24	62100	Oct. 1867
51	Climax, 4-4-0	McKay & Aldus	60	16x24	62100	Oct. 1867

No.	Name	Builder	Dia. of Drivers. Inches.	Cylinders. Inches.	Weight.	Date in Service
52	Tip Top, 4-4-0	McKay & Aldus	60	16x24	62100	Oct. 1867
53	Summit, 4-4-0	McKay & Aldus	60	16x24	62100	Oct. 1867
54	Red Deer, 4-4-0	McKay & Aldus	60	16x24	62100	Oct. 1867
55	Black Deer, 4-4-0	McKay & Aldus	60	16x24	62100	Oct. 1867
56	Grizzly, 4-6-0	Sch. Loco. Co.	48	18x24	71250	Mar. 1868
57	Bison, 4-6-0	Sch. Loco. Co.	48	18x24	71250	Mar. 1868
58	Placer, 4-6-0	Sch. Loco. Wks.	48	18x24	71250	July 1868
59	Pluto, 4-6-0	Sch. Loco. Wks.	48	18x24	71250	July 1868
60	Jupiter, 4-4-0	Sch. Loco. Wks.	60	16x24	65450	July 1868
61	Storm, 4-4-0	Sch. Loco. Wks.	60	16x24	65450	July 1868
62	Whirlwind, 4-4-0	Sch. Loco. Wks.	60	16x24	65450	Sep. 1868
63	Leviathan, 4-4-0	Sch. Loco. Wks.	60	16x24	65450	Sep. 1868
64	Emigrant, 4-4-0	McKay & Aldus	60	16x24	62100	Feb. 1868
65	Mikado, 4-4-0	McKay & Aldus	60	16x24	62100	Feb. 1868
66	Tycoon, 4-4-0	McKay & Aldus	60	16x24	62100	April 1868
67	Hector, 4-4-0	McKay & Aldus	60	16x24	62100	Mar. 1868
68	Pequop, 4-6-0	McKay & Aldus	54	18x24	73800	April 1868
69	Vulcan, 4-6-0	McKay & Aldus	54	18x24	73800	April 1868
70	Saturn, 4-6-0	McKay & Aldus	54	18x24	73800	May 1868
71	Vesuvius, 4-6-0	McKay & Aldus	54	18x24	73800	April 1868
72	Niagara, 4-6-0	Danforth Loco. Wks.	54	18x24	72300	April 1868
73	Terrible, 4-6-0	Danforth Loco. Wks.	54	18x24	72300	April 1868
74	Dragon, 4-6-0	Danforth Loco. Wks.	54	18x24	72300	April 1868
75	Growler, 4-6-0	Danforth Loco. Wks.	54	18x24	72300	April 1868
76	Carrier, 4-4-0	R. Island Loco. Wks.	60	16x24	62100	April 1868
77	Confucius, 4-4-0	R. Island Loco. Wks.	60	16x24	62100	April 1868
78	Mars, 4-4-0	R. Island Loco. Wks.	60	16x24	62100	April 1868
79	Apollo, 4-4-0	R. Island Loco. Wks.	60	16x24	62100	April 1868
80	Phil. Sheridan, 4-4-0	Danforth Loco. Wks.	60	16x24	66400	Feb. 1868
81	U. S. Grant, 4-4-0	Danforth Loco. Wks.	60	16x24	66400	Feb. 1868
82	Buffalo, 4-6-0	Rogers	54	18x24	77450	Mar. 1868
83	Mountaineer, 4-6-0	Rogers	54	18x24	77450	Mar. 1868
84	Gazelle, 4-4-0	Schenectady	60	16x24	65450	Mar. 1868
85	White Bear, 4-6-0	Rogers	54	18x24	77450	April 1868
86	Gorilla, 4-6-0	Rogers	54	18x24	77450	Sept. 1869
87	Tempest, 4-6-0	Rogers	54	18x24	77450	April 1868
88	Hurricane, 4-6-0	Rhode Island	54	18x24	72300	June 1868
89	Giant, 4-6-0	Rhode Island	54	18x24	72300	June 1868
90	Gladiator, 4-6-0	Rhode Island	54	18x24	72300	June 1868
91	Tiger, 4-6-0	Rhode Island	54	18x24	72300	June 1868
92	Verdi, 4-6-0	Rhode Island	54	18x24	72300	June 1868
93	Oronoco, 4-4-0	R. Norris & Sons	60	14x24	?	?
94	Eclipse, 4-4-0	McKay & Aldus	60	15x24	60000	July 1868
95	Driver, 4-4-0	McKay & Aldus	60	15x24	60000	July 1868
96	Clipper, 4-4-0	McKay & Aldus	60	15x24	61000	July 1868
97	Racer, 4-4-0	McKay & Aldus	60	15x24	60000	July 1868
98	Rattler, 4-4-0	McKay & Aldus	60	15x24	60000	July 1868
99	Ranger, 4-4-0	McKay & Aldus	60	15x24	61000	July 1868
100	Rover, 4-4-0	McKay & Aldus	60	15x24	60250	July 1868
101	Hunter, 4-4-0	McKay & Aldus	60	15x24	60250	July 1868
102	Runner, 4-4-0	Rogers	56	15x22	60250	? 1868
103	Rusher, 4-4-0	Rogers	56	15x22	60250	? 1868
104	Rambler, 4-4-0	Rogers	56	15x22	60250	? 1868
105	Roller, 4-4-0	Rogers	56	15x22	60250	? 1868
106	Pacer, 4-4-0	Rogers	56	15x22	60250	? 1868
107	Courser, 4-4-0	Rogers	56	15x22	60250	? 1868
108	Stager, 4-4-0	Rogers	56	15x22	60250	? 1868
109	Flier, 4-4-0	Rogers	56	15x22	60250	? 1868
110	Fire Fly, 4-4-0	Rogers	56	15x22	60250	? 1868

No.	Name	Builder	Dia. of Drivers. Inches.	Cylinders. Inches.	Weight.	Date in Service
111	Chamois, 4-4-0	Rogers	56	15x22	60250	? 1868
112	Hawk, 4-4-0	Danforth Loco. Wks.	56	15x22	60250	? 1868
113	Falcon, 4-4-0	Danforth Loco. Wks.	56	15x22	60250	? 1868
114	Heron, 4-4-0	Danforth Loco. Wks.	56	15x22	60250	? 1868
115	Eagle, 4-4-0	Danforth Loco. Wks.	56	15x22	61000	? 1868
116	White Eagle, 4-4-0	Danforth Loco. Wks.	56	15x22	60250	? 1868
117	Red Eagle, 4-4-0	Danforth Loco. Wks.	56	15x22	60250	? 1868
118	Grey Eagl,e 4-4-0	Danforth Loco. Wks.	56	15x22	60000	? 1868
119	Golden Eagle, 4-4-0	Danforth Loco. Wks.	56	15x22	60250	? 1868
120	Bald Eagle, 4-4-0	Danforth Loco. Wks.	56	15x22	60000	? 1868
121	American Eagle, 4-4-0	Danforth Loco. Wks.	56	15x22	60250	? 1868
122	Willamette, 4-4-0	Globe Wks.	60	16x24	63500	Nov. 1868
123	Geo. L. Woods, 4-4-0	Globe Wks.	60	16x24	63500	Nov. 1868
124	Umpqua, 4-4-0	Globe Wks.	60	16x24	63500	Nov. 1868
125	J. R. Moores, 4-4-0	Globe Wks.	60	16x24	63500	Nov. 1868
126	Swiftsure, 4-4-0	McKay & Aldus	56	15x22	60000	Aug. 1868
127	Mercury, 4-4-0	McKay & Aldus	56	15x22	60000	Aug. 1868
128	Herald, 4-4-0	McKay & Aldus	56	15x22	60000	Aug. 1868
129	Fleetfoot, 4-4-0	McKay & Aldus	56	15x22	60000	Aug. 1868
130	Favorite, 4-4-0	McKay & Aldus	56	15x22	60000	Aug. 1868
131	Greyhound, 4-4-0	Rhode Island	56	15x22	60000	? 1868
132	Deerhound, 4-4-0	Rhode Island	56	15x22	60000	? 1868
133	Foxhound, 4-4-0	Rhode Island	56	15x22	60000	? 1868
134	Trapper, 4-4-0	Rhode Island	56	15x22	60000	? 1868
135	Peeler, 4-4-0	Rhode Island	56	15x22	60000	? 1868
136	Swallow, 4-4-0	Rhode Island	60	16x24	62100	? 1868
137	Lark, 4-4-0	Rhode Island	60	16x24	62100	? 1868
138	Bluebird, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
139	Blue Jay, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
140	Ostrich, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
141	Magpie, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
142	Raven, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
143	Swan, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
144	Crane, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
145	Dart, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
146	Arrow, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
147	Rheindeer, 4-4-0	Schenectady	56	15x22	60100	Sept. 1868
148	Red Fox, 4-4-0	Schenectady	60	16x24	65450	Sept. 1868
149	Black Fox, 4-4-0	Schenectady	60	16x24	65450	Sept. 1868
150	Grey Fox, 4-4-0	Schenectady	60	16x24	65450	Sept. 1868
151	Yellow Fox, 4-4-0	Schenectady	60	16x24	65450	Sept. 1868
152	White Fox, 4-4-0	Schenectady	60	16x24	65450	Sept. 1868
153	Young America, 4-4-0	Rhode Island	60	16x24	62100	Dec. 1868
154	Charmer, 4-4-0	Rhode Island	60	16x24	62100	Dec. 1868
155	Sun Beam, 4-4-0	Rhode Island	60	16x24	62100	Dec. 1868
156	Success, 4-4-0	Rogers	60	16x24	67670	Apr. 1869
157	Excelsior, 4-4-0	Rogers	60	16x24	67670	Apr. 1869
158	Eureka, 4-4-0	Schenectady	60	16x24	65450	June 1869
159	Diana, 4-4-0	Schenectady	60	16x24	65450	June 1869
160	Sultana, 4-4-0	Schenectady	60	16x24	65450	June 1869
161	Juno, 4-4-0	Schenectady	60	16x24	65450	May 1869
162	Flash, 4-4-0	Schenectady	60	16x24	65450	May 1869
163	Fancy, 4-4-0	Schenectady	60	16x24	65450	July 1869

The Old Iron Horses of the Central Pacific.

The old employees of the Central Pacific always spoke of the original 163 Locos. of the C. P. as the "Iron Horses", therefore I will give that title to this little sketch. And those old timers were iron, for as far as I can learn there was very little steel about them. There was considerable brass and gold leaf in the trimming and lettering and those that were used in passenger service had their drive wheels painted a bright red. They surely must have presented a beautiful appearance with their names in gold leaf on the sides of the cab, with stripes of gold where ever it could be applied with the initials C. P. and the number between the C. and P. on the tanks with more gold and shaded with green and red. Grab irons, hand rails, bands that held on the jacket, bell, whistle, safety valves and pumps of shining brass, rims of the mud guards edged with brass, head light painted a green color with gold stripes and every part of them shining. They surely must have presented a very beautiful appearance.

Some of them had pictures painted on the headlight and some had pictures painted on the sides or back of the tanks. The Bison for instance, had a buffalo painted on both sides of the tank, the Phil Sheridan had that man's portrait on both sides of the tank, the U. S. Grant had General Grant's portrait on the headlight and so on. Unfortunately I have never been able to get a hold of any photos of the Loco's with portraits altho pictures were taken as the old news papers tell of it.

Nearly all of the old iron horses have gone, gone also are the old timers that took such pride in their iron steeds and all that we have left to us is a few dusty records that were saved from several fires and a photo now and then that some employee had taken of his steed, and even these are hard to locate, because the present generation see nothing of value in the old records or photos and as a rule consign them to the stove.

The fire in San Francisco in 1906 destroyed much valuable records and a large number of drawings and photographic plates, many of them wet plates. Then in 1917 a fire in Sacramento shops destroyed several cases of old drawings and pictures that were stored in the loft of the car department.

So we have very little left to us, except what we can dig out of the old files of newspapers in the State library and a photo that we can get a hold of from the family of an old employee.

The Gov. Stanford, as I have already stated was the first loco to operate on the C. P. R. R. of Calif. She was used first in construction work, then hauling the combination freight and passenger trains, then as a passenger & finally as a switcher at the C. P. Station. In 1894 she was marked up for scrap, but orders were given to doll her all up in her former glory and she was sent to Stanford University where she is to this day. The C. P. Huntington named after C. P. Huntington one of the "big 4" who built the road was too small to be used for any purpose except to switch. In 1869 however, she was used to haul the passenger train between Sacramento and Stockton over the Western Pacific R. R.

Later she had a weed burning attachment put on and was used to burn the weeds off of the right of way. She was later mounted on a trestle in the new machine shop at Sacramento. In 1915 the S. P. Co. took the little loco to San Francisco and exhibited it at the Worlds Fair along side of one of the giant Mallets a 2-4-4-2 type.

After the Fair the C. P. Huntington was brought back to Sacramento and placed on a Knoll in the Plaza at the S. P. Station where it is now stationed. During the days of '49 celebrations in May 1922 she was steamed up and hauled passengers around the city for a fare of 49 cents.

It has been said from time to time that the C. P. Huntington once hauled the trans-continental trains, but this is not so. I have questioned old employees, dug up and scoured files of old newspapers and searched old records and can find nothing to substantiate the statement that the C. P. Huntington ever hauled the overland trains, or that she ever hauled any trains on the main line except the Stockton passenger for a while and Gov. Stanford's private car for a short time.

Her number was originally #3 C. P., but when she was sold to the S. P. R. R. of California, her number was changed to #1, and she still bears that number.

The T. D. Judah and C. P. Huntington were originally alike The Judah was rebuilt in 1884, and after hauling the pay

car for a few years was sold to a sugar plantation in the Hawaian Islands, where she is still in service.

The Conness No. 6 was named in honor of Senator John Conness of California, and was built by Mr. Mason. She was No. 212 on Mr. Mason's list, from the records that I obtained from Mr. Herbert Fisher. She came to Sacramento in Feb. 1864, according to an article in the Sacramento Union of Feb. 1864. She came knocked down and had never been painted. She served the C. P. and S. P. Co. for 34 years, and was in all branches of the service, from hauling the trains over the mountain to hauling the Overland Limited from Sacramento to Oakland, down through the valley, and finally ended in work train service. In 1908, becoming too light for the ever-increasing size of trains and her boiler decreasing in safety below a factor of 4, she was broken up at Sacramento.

During her 34 years she burned first pine chunks, then oak wood, then hard coal, soft coal and finally in 1902 she was converted to burn fuel oil. Her front end was never extended, and she had a diamond stack when she was scrapped.

The Owyhee and the Idaho were exactly like the Conness, and were also built by Mr. Mason, but did not last as many years, being unfortunate. The Idaho blew up at Ogden, due to carelessness of her fireman, and the Owyhee was almost completely demolished in a head-on collision, and was never rebuilt.

The Idaho hauled the first train over the C. P. that had come overland from the East. That train was the one that brought the Sovereign Grand Lodge of Odd Fellows from Baltimore, and consisted of 11 silver palace sleeping cars, a dining car and a baggage car.

The Jupiter No. 60 had the honor of participating in driving the last spike at Promontory, May 10, 1869.

She pulled the special train from Sacramento to Promontory, leaving Sacramento on the morning of May 9th with 5 coaches and one baggage car, and had President Stanford's private car attached. In the picture, "Driving the Last Spike," the front end of the Jupiter shows, as does also President Stanford of the C. P. and President Durant of the U. P., holding the hammers that they used in driving the spike.

That painting was made from a photo taken by Alfred Hart of Sacramento.

The Tempest, No. 87, a Rogers build with cylinders on an incline, was dispatched from an Eastern Port on board of a sailing vessel in March, 1868, but did not arrive in San Francisco until August, 1869, and the C. P. began to think that she was lost. The boat she was on was driven out of her course, lost her rudder and met with so many accidents that it was a miracle that she ever got to San Francisco at all.

The Umpqua, No. 124, a Globe build, afterwards renumbered 1212, was used for years at the State Prison at Folsom, and was manned by convicts. She had her water tank well hole padlocked, as several times prisoners had escaped by hiding in the water tank.

The Young America, No. 153, was a most unfortunate Locomotive. After being set up, she started out on a trial trip, but did not get far, as a bolt had been left in her steam chest, and the slide valve coming in contact with the bolt pushed it through the steam chest and cracked the cylinder. A new cylinder was ordered from the Rhode Island people and the Young America started out again. The tracks of the C. P. and S. V. R. R. were side by side on Front St., with several switches connecting. The Young America took one of these switches and side-swiped the rear end of the Pioneer of the S. V. R. R., breaking off the left cylinder of the Young America and starting the Pioneer on her way with no one on board, and without her tender, which was jammed into the 153.

The fireman of the Pioneer was close at hand and gave chase to his locomotive on a hand car, overtaking her at Brighton, when her steam gave out.

The Young America was again hauled in the shop and the C. P. cast a new cylinder for her and she was once again started on her way. This time she met the Sacramento of the Western Pacific in a head-on collision in the Niles Canyon and demolished her entire front end, both cylinders included. After being rebuilt she did not meet with any more accidents.

The Black Fox, No. 149, a Schnectady 8-wheeler, pulled the Jarrett and Palmer special from Promontory, Utah, to Oakland, California, in the late 70's, and made a famous dash that is still talked of.

The Pequop, No. 68, a McKay and Aldus 10-wheeler, is still in service on the S. P., being now 2001—C. P. She went into service on the C. P. in April, 1868.

The No. 86 Gorilla hauled the pay car for years. That was in the days when the Company paid in gold. The Gorilla was still hauling the pay car in 1905, when the Company decided to discontinue the pay car. The Company now pays twice a month and pays by voucher. Instead of gold now we get currency in exchange for our vouchers.

Time was in California when people refused to accept currency, because they were afraid it was counterfeit.

Now gold is as seldom seen as paper was a few years ago. I have even had people lately refuse to accept a 20-dollar gold piece, because they thought it was counterfeit. Verily, times change.

The first classification sheet of the C. P. was gotten out in Nov., 1868, and included all of the Locomotives then in service or on order. In 1875 the first classification book was gotten out, and then a new book was gotten out on an average of every 10 years until 1908. Now they come out as the doctors say p. n. n. (as often as necessary).

I have a copy of the 1868 sheet (an original); also the 1875 book, and several later books.

If the members have not gotten weary of the C. P. R. R., I will later on speak of a few more incidents on the C. P.; also will tell of some few incidents on the O. & O. R. R. when it was young.

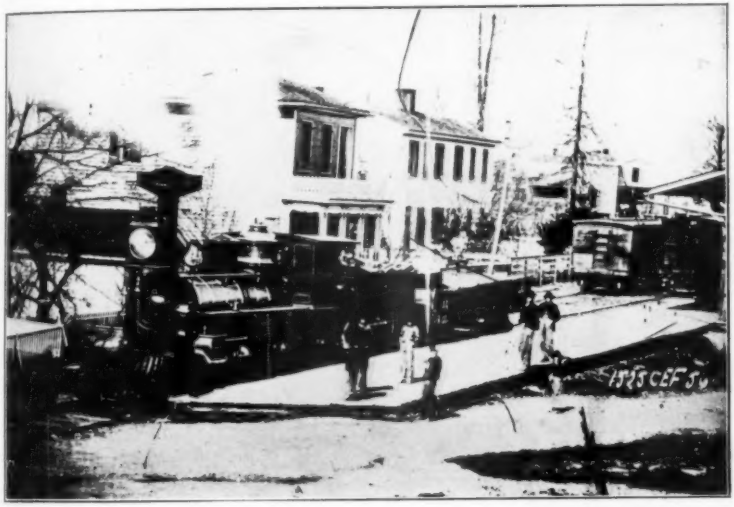
I am deeply indebted to the State Library and their files of old newspapers, as much of the early history of the C. P. is contained in those old newspapers, the C. P. having lost their records in the two fires that I spoke of.

The Locomotives of the C. P., from 156 to 163, had been ordered from the McKay and Aldus builders, but that firm failing, the order was turned over to the Rogers and Schenectady people, who filled the order.

Early Recollections.

By B. C. Vaughan, Retired Mechanical Foreman, L. & N. R. R.

I first began work in the summer of 1856 at West Frankfort, Kentucky, with my father, James Vaughan, who was in charge of the roundhouse at that point. This was for the old Louisville & Frankfort R. R. At that time the Kentucky River bridge had not been built and trains stopped at West Frankfort and passengers walked over the suspension or wire bridge in and out of Frankfort. The Lexington & Frankfort R. R.



Louisville & Frankfort R. R.—"Frankfort," at Eminence, Ky.—an early Hinkley engine.

brought all passengers and freight to and from Lexington, and all freight was hauled over the wire bridge in wagons. Later a five-ton engine was put on to handle the bridge transfer. This engine was named the "Logan", was of English build, with one pair of driving wheels and hook motion valve gear. The engineer was John Fogerty and the fireman was Henry Cuvins.

After the Kentucky River bridge was built my father and I were transferred to Lexington. The two roads were consoli-

dated and named the Louisville & Lexington R. R., and trains ran through to Louisville. I worked in the shops at Lexington for a time and later was put on firing the "Daniel Boone". This was the seven-ton, English built engine, single pair of drivers with hook motion. My engineer was John McCann, and we were on one of the ditching trains. I fired this engine until I was able to fire one of the through trains. This was the latter part of 1859.

In 1862 I was promoted to engineer and ran between Louisville and Lexington. During the Civil War I had many close calls between outlaws and bushwackers. Many times my engine was fired into, cab shot full of holes, headlight shot to pieces, or ditched; big rocks rolled down from the top of cuts, cattle guards stuck full of ties and many a running fight with train guards and confederates and bushwackers. The life of an engineer was far from pleasant, but I came through safely without a scratch.

On a trip to Louisville with a train of government supplies I was hailed by two or three hundred Confederates at Pleasureville, Henry County. They were on the track in front of me waving me to stop. I looked at the switch targets and saw they were allright for the main line, and instead of stopping I blew a stock whistle, opened the throttle as wide as I could and passed them like a shot. A volley followed from them, but it did no harm, and I made a home run with my train. I had forty train guards in the last car that were glad I did not stop.

I was captured with my train nine miles west of Frankfort in 1864. My engine was cut loose from the train and I was ordered to start the engine ahead with high steam pressure to meet a soldier train which was to meet us at Bagdad, five miles away. Guns were aimed at me so I could not remain in the cab after I had started the engine, but I was given a moment to leave the cab after I had opened the throttle. Unnoticed by them I slipped my water pump on full so the steam would be reduced and the boiler flooded with water which would "kill" the engine. My rear brakeman, seeing the capture ahead, jumped off and ran back to a bridge guard of about seventy-five men only about three hundred yards back, and while my captors were parlying about what to do with the train, the bridge guards slipped up and fired on them. The bullets whistled about, giv-

ing me a chance to hide, and in about five minutes I was alone. My fireman and train crew also disappeared. As soon as the scrap was over I lit out to overtake my engine, but was minus my watch and $69.00, which I had to give up to the "gray coats". I captured a horse and "hit the high spots". My engine had run about eight miles and then "died". The opposing train happened to be away late and I got to my engine just in time to flag the soldier train.

After the war was over in 1865, on the 9th of November, I started from Lexington to Louisville with a train load of colored soldiers going west. I was running second section, following another train of colored soldiers. I left Lexington thirty minutes behind them, and on my arrival at Paynes Depot, I found them standing on the main line without any flag out to protect them. I blew for brakes, and all the brakemen flew to the softest place they got a glimpse of. After doing all I could to stop I decided to vacate my cab and take my chances in the open air. I went down a ten-foot fill and was up on my feet in short order. Cars and "niggers" filled the air, and I thought a hundred was killed or crippled. I rushed back and was trying to put the fire out in the cab when some officers rushed up and ordered me taken off and shot. I tried to explain, but it was no use and my chances looked very poor to me. I jerked open the surface cock and a two-inch stream of steam and water blew the devil out of the whole bunch, and while the fog of steam was blowing I lit out for safer quarters. Before the steam had given out I had gotten three hundred yards away and was still "hitting the high spots". Two soldiers spied me and shot, but I made my run to a bend in Elkhorn Creek, and as I was about winded did not attempt to swim across. I waded up the edge of the creek that was lined with bushes and came out on spread hemp to a fodder shock. Soldiers were all around the spread hemp but had given up the hunt after finding my tracks to the edge of the creek. I layed in the fodder shock until dusk and crawled out. After walking about two miles I stopped at Preacher Stout's all night. I found out the preacher was O. K. and I told him my accident. I slept fine, with a double barrel shot gun at my head that was given me. Mr. Stout sent me in a buggy to the city limits of Lexington, and I sneaked over to my aunts to find out how the land lay and if I was being looked

for. My people were afraid I had been caught and killed by the soldiers. Thinking it would be safe, I took a train to Louisville, but I did not hop off at any stations. The next day I made my report to "Sam" Gill, Superintendent, and he advised me to leave until the excitement was over with the "niggers", as they thought I had run through their train on purpose and would lay for me on the road.

I left and went West to Kansas City and remained away two years. As business was dull on the road I declined to take on extra work, and took a job as engineer at the Turner & Clay distillery, afterwards the Tarr & McGibbins distillery.

The railroad was finished to Mt. Stirling in 1871, and my old Master Mechanic, John Skidmore, sent for me to take the place as terminal foreman and yardmaster. The L. C. & L. had the Mt. Sterling line leased. I remained in this capacity, also as extra engineer, until the Chesapeake & Ohio was completed to Huntington. Then The L. C. & L. gave up the road and brought me to Lexington as roundhouse foreman. After four years at Lexington I was sent south to Montgomery, Ala., as Assistant Master Mechanic. I remained at Montgomery four years and resigned on account of my health. I was told there was no place open for me, and I would have to wait for a vacancy. I then wrote to my friend, Mr. S. R. Tuggle, Master Mechanic at Covington for the old Kentucky Central R. R. He replied that he had no place open for me as foreman, but to come on and he would place me on as good an engine as ever was, as engineer. I told my Superintendent of Machinery that I was going to leave, and he told me he would send me back to Lexington as soon as a damage suit was settled, and in 1887 I was transferred back to Lexington. I remained here as Mechanical Foreman until pensioned on April 1st, 1909.

As to the old engines on the Louisville & Frankfort R. R., they were as follows: "Louisville", "LaGrange", "Eminence", "Henry", "Shelby", "Frankfort", "S. T. Hobbs"—named after the President of the Road, "Tom Smith" and "Johnnie Jacobs", all hook motion and wood burners. The builders were "Dicky" Norris, Hinkley, Baldwin, Brant, Moore & Richardson and Harkenson. The "Jacobs" blew up near Frankfort and killed the engineer and fireman. The "Eminence" blew up at Bagdad, but no one was hurt, as the crew

were in the Bagdad Hotel eating when the boiler let go. Parts of this engine were found three miles away. A new Baldwin engine named "Scott" blew up in the street at Frankfort and killed nine people. All the train crew except the engineer and fireman were killed. I followed this train into Frankfort and used my engine in clearing up the wreck.

The old engines on the Lexington & Frankfort R. R. were as follows: "Elkhorn", "Nottoway" and "Joe Davis", all five-ton English engines, "Daniel Boone", a seven-ton Baldwin engine, "Logan", the "McKee", a 14-ton Norris, "Dudley", a fifteen-ton Hinkley, and the "C. N. Warren", an eighteen-ton Swineburn. The "Elkhorn" and "Nottoway" were about worn out, and only made a trip in case of shortage of power.

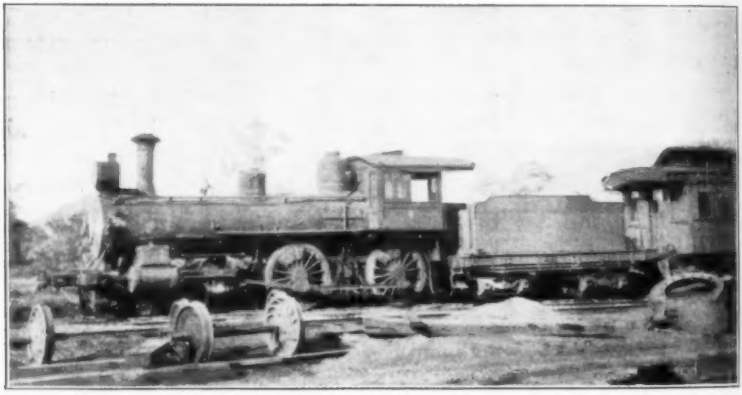
The Lexington & Frankfort was not much of a road until after the Louisville road consolidated with them. Horses were first used to handle the passengers on this road. The Louisville road received two new engines about 1863, the "Watson" and the "H. H. Murray". They were McQueen engines, costing about $25,000 each, and the brass had to be kept shining like a diamond.

In those days when a Master Mechanic was to promote a fireman, he would call him into his office and question him regarding the break-downs on the road. Then he would send him alone to a pair of main driving wheels and they had to set all the eccentrics right, before he would promote them. In those days there were three on each side—go ahead, back up and cut off. All hook motion, cross head pumps, no injectors, half the engines had no steam gauges, only three or four gauge cocks, no cab lights, no soft seat boxes—you had to stand up, at least until you left the yard, and then you might pick up an empty nail keg that you had hid before coming in the roundhouse. Engineers washed out their boilers, set out cylinder packing, packed valves, pistons and valve stems. You made two round trips on the road and worked two days in the shops in one week. Firemen cleaned all the brass, cabs and jackets, stacks and front ends. Whenever the Master Mechanic or foreman was setting valves you had to use a pinch bar for half a day at a time. Overtime was unknown. You would get thirty days' rest if you complained of long hours on the road with leaky flues and no steam. There were no stack blowers in those days, few water

tanks, and if you ran out of water you had to dip it from any place you could get it. I fired for a man that used to carry three gauges of water in the smoke stack and had to use the blow-off cock right often. No one knows the hardships of early railroad life except those that were in the service back in the fifties and sixties.

The L. & N. officials are, I believe, the best of officers in the country. I have known almost all the officials from 1856 to the time I was retired. All the old officials have passed away. There is not one of them living that I worked under, not even a section foreman. I believe I am the only living employe left of the Civil War. I am sure there is none on the L. C. & L. Division, and I don't think there is any on the L. & N. system. I am in my eightieth year and I get around very well at that; I'm not so very old yet.

It may not be out of place to reproduce, in connection with Mr. Vaughan's interesting recollections, four photographs of



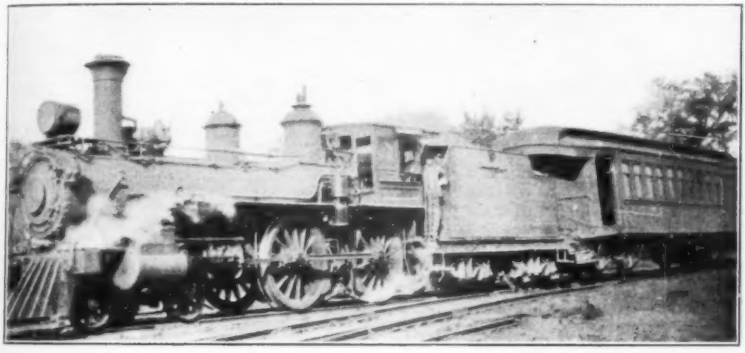
M. & N. F. #6.

locomotives in actual service in the summer of 1923 in Kentucky.

Through the kindness of Mr. Geo. H. Gearhart, General Manager of the Morehead & North Fork R. R., your editor is able to reproduce photographs of engines numbers 6 and 8 of that road. Mr. Gearhart writes that engine #6 was originally Louisville, Henderson & St. Louis #3 and purchased from that

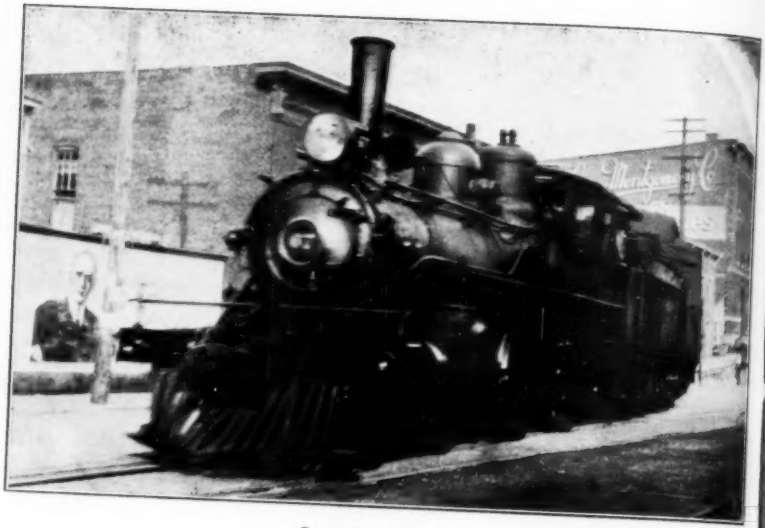
road in 1913. This engine was originally built by the Pittsburgh Locomotive Works in July, 1888. Engine #8 was originally Nashville, Chattanooga & St. Louis Ry. #17. This engine was rebuilt by that road in the 80's and was probably built by the Rogers Locomotive Works in the 70's. There were ten in the original order, and were numbered from 50 to 59 inclusive. At the time they were considered the best and heaviest engines on the road. Both of these engines are still in service on the Morehead & North Fork R. R., and the #8 was of decided interest to your editor.

Louisville & Nashville R. R. #67 was originally built by the Taunton Locomotive Works for the Union Pacific R. R., and the



M. & N. F. #8.

L. & N. records state this engine was built in 1871. This locomotive came to the L. & N. with the purchase of the Louisville & Atlantic R. R. It was purchased by the L. & A. from the Hicks Locomotive Works, and when received by the L. & A. the cab was riddled with bullet holes. This engine is an "old settler", and although rebuilt by the L. & N., still retains some of the marks of the Taunton Works. She is called by the railroad men "Old Maud", and is now in service between Frankfort and Ravenna, Ky., where she has been for over thirty years. L. & N. #124 is an interesting example of the type of power built at the Louisville Shops of that company in the 80's. This engine was built in 1885. Ten years ago these engines were common enough on the L. & N. on the lighter runs. Now they are fast disappearing from even the branch lines.



L. & N. #67.

L. & N. #124.

The Nova Scotia Engines.

The town of Pictou, Nova Scotia, can lay claim to having one of the first railways in Canada. In 1818, when the coal mines at East River were opened, a tram road was built from the pit head to the head of the tide. The coal shipments were small until the property was transferred, in 1827, to a site further down the river. As trade increased, this site became very inconvenient, because of the shallow water and other sites further down were found from time to time, until in the course of ten years, four moves were made.

The gauge of the tram road was 4 feet 8½ in. (now standard), which was the gauge used in coal mines of England. The work was done by horses. Sidings were placed at every half mile, the horse taking a full load, and leaving it on the siding for the next horse, would return with empty car.

Trade grew, until in 1834 much improved facilities were needed. A site was found about five miles further down river, at a place with ample water for the loading of large ships. This site was finished in a most substantial manner about 1838 and for the use of locomotive engines instead of horses. After being in operation for half a century, it was abandoned, and the shipping of coal transferred to the wharves at the head of Pictou Harbour with access to the Intercolonial Railway's branch to Pictou Landing (now Canadian National).

In 1838, the first locomotives for the road came out from England, in a sailing vessel. The passage was a long one of six weeks, but the ship had a wonderful cargo, consisting of the parts of three locomotives, the "Samson", "John Buddle" and the "Hercules".

These machines were made by the English locomotive builder and designer, Timothy Hackworth, at his shops at New Shildon. The maker's name is still on the "Samson", "Timothy Hackworth, New Shildon, Durham, Aug. 1838". The "Samson" was the first engine set up. George Davidson, who came out with the engines, was the first engineer, and continued to run it up to the year 1882. When the old engine was sent to the World's Fair in Chicago in 1893, Davidson was in charge; he was of Scottish parents, and born and brought up at Newcastle-

upon-Tyne. David Floyd was fireman; he was born in County Meath, Ireland.

The engines closely followed the design of locomotives as built in England at that period for the Stockton and Darlington Railway, and of which Hackworth was superintendent "of the permanent and locomotive engines".

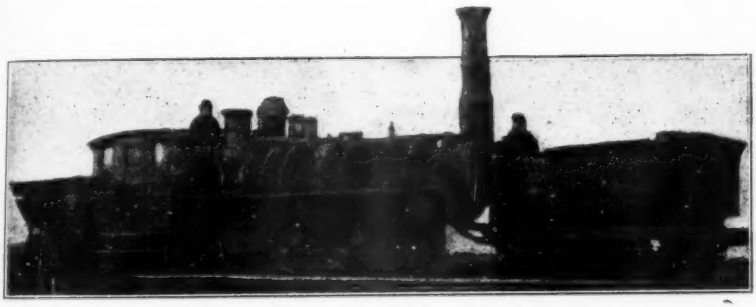
The "Samson" had upright inverted cylinders at the trailing end of the engine 15¼ inches in diameter and a 16-inch stroke, Watts' parallel motion instead of crosshead and guides, six-coupled cast iron "plug" wheels 4 feet in diameter, and a wheel base of 8 feet, 8 inches, boiler 13 feet 4 inches in length with a working pressure of 60 pounds, and a water capacity of 540 Imperial gallons. All gages were on the side of the boiler and the engineer had to leave his place to read them. The single return flue was of ⅜-inch plate, single riveted, 26½ inches in diameter around fire and 18 inches where it entered the smokebox. The engines had no sandboxes, but instead carried two pails of sand and the sanding of the track done by hand. The tender was in front and the fireman alone attending to the fire. The driver was seated in an iron chair behind the engine and at the front was hung an iron basket filled with fire to light the way at night. The weight of engine was seventeen tons of 2,240 pounds, and cost £2,140.

The Samson was not the first locomotive in Canada, as the first one was sent out by Robert Stephenson & Co., of Newcastle-upon-Tyne, in 1836, for the St. John and Laprani, Canada's pioneer railway, and was called the "Dorchester". This engine had cylinders 9x14 inches, two wheels leading, four drivers 48 inches in diameter and two wheels trailing, boiler 27 inches in diameter and 78 inches long, containing 64 tubes 1⅝ inches outside diameter, the firebox dimensions were: length, 18¼ inches; width, 43 inches, and depth, 28 inches. Weight, in working order, 12,544 pounds.

When the big wheels and all parts of the "Samson" had been assembled, it was gazed upon by an awe-strickened crowd, as few, if any, had ever seen a steam engine, and it looked little short of a miracle and wonderful in their eyes. They were to run down to New Glasgow, about four miles away. Fireman Floyd had steam up, and Engineer Davidson was in his place, with Patrick Kerwin as his conductor. Amongst the crowd gathered

that day, was his little daughter Margaret. Just before the start was made the conductor ran into the crowd, snatched up his little girl, saying "Maggie shall have the first ride to make her remembered in the land". He did not realize then how she herself would appreciate the honor during her whole life.

The "Samson" was doing its best to make history that day. The next day the train was to run free to the "loading grounds". There was "something doing" then. People came from miles around, to witness the sight, and have the honor of a ride behind the steam engine. All who could crowd on the train did so. They were packed on like sardines, but thrilling with excitement at the wonderful adventure (Nothing thrilling about it today, unless possibly a ride in the locomotive cab). A great feast had been prepared in an unique way. A large brick oven had been

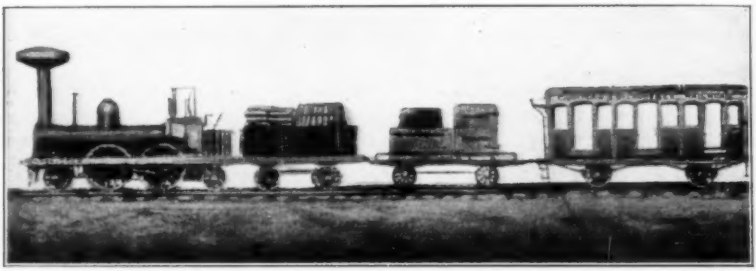


The "Samson."

erected, large enough to hold the carcass of an ox, a big fat one at that. It was stuffed like a turkey and roasted whole, suspended by the hind feet. Men kept turning him constantly and barrels of melted butter were used for basting. To do so, two men had to climb ladders, and use long handled ladles. When cooked it was laid on a large table and served. The invited guests came first, then the crowd; rib loin, surloin, tenderloin, basted with butter—a feast fit for a king (No kings there, except the king of transportation, the locomotive). Of course, there were all kinds of other cooked foods supplied by the farmers. Everybody was trying to make this a day well worth remembering. Oh! good old days when eggs, milk and chickens could be bought for a few cents and people lived the simple life,

but they "had nothing on us" when it came to railroad transportation.

Next on the program was a procession. Horses from the mines, truck horses and the best horses the company owned were lined up in pairs. On them sat riders all dressed alike; white trousers and vests, short Eton jackets, and caps of blue with tassels. Bright sashes of different colors, tied at the side floated out like pennants of a ship, as they rode along. They had bands, too, and they rode and marched to New Glasgow and back, great crowds following—people who had already walked thirty, forty or fifty miles to see the wonder of the age, the locomotive engine. With bands playing and the people cheering, it made a most inspiring sight. In the evening a grand ball was given. All invited guests danced in the inn, the crowd out in the open, where great platforms had been erected for the purpose. All night long,



Canada's Pioneer Railroad Train with Locomotive "Dorchester."

Strathspeys, reels, jigs, hornpipes, etc., were danced to the lively strains of many fiddles. Every one donned his or her best in honor of the occasion.

Many years have passed since that "grand" affair. Mr. Davidson, after his retirement, went to live at Port Morien, Cape Breton, and his last days were spent in Virginia, United States, with a brother who had settled there. Mrs. McGrath, "little Margaret", lived to be quite an old lady, and she never forgot she had the honor of being one of the first passengers in British America to ride behind an engine. But where is the "Samson"? Probably somewhere in the States, as it was exhibited at the World's Fair, by the Baltimore and Ohio Railroad.

The "Samson", "John Buddle" and "Hercules" were followed by the "Albion" and the "Pictou" with inclined cylinders and tubular boilers, and in 1853 by the "Vulcan" with cylinders placed horizontally.

These old machines were well made, by the fact that the original pins and brass bushings in the levers and stuffing boxes were still in place, and showed very little wear after nearly half a century of service.

In Memory of

EDWARD G. RIGGS,

Room #3050, Grand Central Terminal,

New York, N. Y.

Who Died January 17th, 1924.

In Memoriam.

FREEMAN W. SMITH,

140½ Oxford St.,

Portland, Maine

Who Died April 25, 1924.